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THE AMERICAN SPECIES OF THE MYRMICINE ANT GENUS *CAREBARA* WESTWOOD (HYMENOPTERA: FORMICIDAE)

Las especies americanas del género de hormigas mirmicinas *Carebara* Westwood (Hymenoptera: Formicidae)

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ABSTRACT

The revision of the American species of *Carebara* Westwood is offered. This study recognized one genus and 31 species (20 described as new) from United States to Argentina as follow: *Carebara* Westwood, 1840 (= *Oligomyrmex* Mayr, 1867 syn. nov.; = *Aeromyrma* Forel, 1891 syn. nov.; = *Aneleus* Emery, 1900 syn. nov.; = *Erebomyrma* Wheeler, 1903 syn. nov.; = *Paedalgus* Forel, 1911 syn. nov.; = *Lecanomyrma* Forel, 1913 syn. nov.; = *Spelaeomyrmex* Wheeler, 1922 syn. nov.; = *Hendecatella* Wheeler, 1927 syn. nov.; = *Solenops* Karawajew, 1930 syn. nov.; = *Sporocleptes* Arnold, 1948 syn. nov.; = *Crateropsis* Patrizi, 1948 syn. nov.; = *Nimbamyrma* Bernard, 1953 syn. nov.; = *Afroxyidris* Belshaw & Bolton, 1994 syn. nov. (provisional); = *Neoblepharidatta* Sheela & Narendran, 1997 syn. nov). The following species complexes and species are recognized and proposed: *Carebara concinna* SPECIES COMPLEX: *C. longii* (Wheeler) comb. nov. (USA); *C. peruviana* (Emery) comb. nov. (Perú); *C. urichi* (Wheeler) comb. nov. (México to Brazil) [= *Erebomyrma nevermanni* Mann syn. nov.; = *Erebomyrma morai* (Menozzi) syn. nov.; = *Erebomyrma eidmanni* Menozzi syn. nov.; = *Erebomyrma urichi* (Wheeler); = *Oligomyrmex nevermanni* (Mann); = *O. morai* (Menozzi); = *O. eidmanni* (Menozzi)] and *C. brevipilosa* sp. nov. (Costa Rica to Brazil). *Carebara lignata* SPECIES COMPLEX: *C. anophthalma* (Emery) (Brazil, Ecuador, Guyana) [= *C. winifredae* Wheeler syn. nov.]; *C. bicarinata* Santschi (French Guiana); *C. bruchi* (Santschi) comb. nov. (Argentina); *C. coeca* sp. nov. (Brazil, Colombia); *C. elongata* sp. nov. (Colombia); *C. globularia* sp. nov. (Colombia); *C. incierta* n.n. (Brazil); *C. longiceps* (Santschi) comb. nov. (Argentina); *C. mayri* (Forel) (Paraguay); *C. minuta* sp. nov. (Brazil); *C. panamensis* (Wheeler) comb. nov. (Panamá); *C. reticulata* sp. nov. (Colombia); *C. stenoptera* (Kusnezov) comb. nov. (Argentina); *C. tenua* sp. nov. (Brazil). *Carebara escherichi* SPECIES COMPLEX: *C. angulata* sp. nov. (Colombia, Ecuador); *C. audita* sp. nov. (Colombia); *C. brasiliana* sp. nov. (Brazil); *C. inca* sp. nov. (Perú); *C. intermedia* sp. nov. (Belice); *C. kofana* sp. nov. (Colombia); *C. majeri* sp. nov. (Brazil); *C. nuda* sp. nov. Brazil; *C. paya* sp. nov. (Colombia); *C. pilosa* sp. nov. (Brazil); *C. reina* sp. nov. (Colombia); *C. striata* sp. nov. (Colombia, Brazil, Perú) and *C. semistriata* sp. nov. (Colombia). The following combinations are proposed for the Old World species of *Paedalgus*: *Carebara distincta* (Bolton & Belshaw) comb. nov., *Carebara escherichi* (Forel) comb. nov., *Carebara infima* (Santschi) comb.

nov., *Carebara octata* (Bolton & Belshaw) comb. nov., *Carebara pisinna* (Bolton & Belshaw) comb. nov., *Carebara rara* (Bolton & Belshaw) comb. nov., *Carebara robertsoni* (Bolton & Belshaw) comb. nov., *Carebara sarita* (Bolton & Belshaw) comb. nov., *Carebara sudanensis* (Bolton & Belshaw) comb. nov. and *Carebara termitolestes* (Wheeler) comb. nov. The definive knowledge of the taxonomy of *Carebara* needs to await more complete series, including female, male and especially major with minor workers (in the dimorphic species). *C. minuta* would be one of the smallest ant species of the World with a head width of 0.21 mm and total length slightly below 1 mm.

Key words. America, ants, litter, insects, Neotropical Region, new taxa.

RESUMEN

Se presenta la revisión de las especies americanas de *Carebara* Westwood. Este trabajo reconoce un género y 31 especies (20 descritas como nuevas) desde Estados Unidos a Argentina como sigue: *Carebara* Westwood, 1840 (= *Oligomyrmex* Mayr, 1867 syn. nov.; = *Aeromyrma* Forel, 1891 syn. nov.; = *Aneleus* Emery, 1900 syn. nov.; = *Erebomyrma* Wheeler, 1903 syn. nov.; = *Paedalgus* Forel, 1911 syn. nov.; = *Lecanomyrma* Forel, 1913 syn. nov.; = *Spelaeomyrmex* Wheeler, 1922 syn. nov.; = *Hendecatella* Wheeler, 1927 syn. nov.; = *Solenops* Karawajew, 1930 syn. nov.; = *Sporocleptes* Arnold, 1948 syn. nov.; = *Crateropsis* Patrizi, 1948 syn. nov.; = *Nimbamyrma* Bernard, 1953 syn. nov.; = *Afroxyidris* Belshaw & Bolton, 1994 syn. nov. (provisional); = *Neoblepharidatta* Sheela & Narendran, 1997 syn. nov.). Los siguientes grupos de especies son reconocidos y propuestos: *Carebara concinna* COMPLEJO DE ESPECIES: *C. longii* (Wheeler) comb. nov. (EE.UU); *C. peruviana* (Emery) comb. nov. (Perú); *C. urichi* (Wheeler) comb. nov. (México to Brasil) [= *Erebomyrma nevermanni* Mann syn. nov.; *Erebomyrma morai* (Menozzi) syn. nov.; = *Erebomyrma eidmanni* Menozzi syn. nov.; = *Erebomyrma urichi* (Wheeler); = *Oligomyrmex nevermanni* (Mann); = *O. morai* (Menozzi); = *O. eidmanni* (Menozzi)] y *C. brevipilosa* sp. nov. (Costa Rica to Brasil). *Carebara lignata* COMPLEJO DE ESPECIES: *C. anophthalma* (Emery) (Brasil, Ecuador, Guyana) [= *C. winifredae* Wheeler syn. nov.]; *C. bicarinata* Santschi (French Guiana); *C. bruchi* (Santschi) comb. nov. (Argentina); *C. coeca* sp. nov. (Brasil, Colombia); *C. elongata* sp. nov. (Colombia); *C. globularia* sp. nov. (Colombia); *C. incierta* n.n. (Brazil); *C. longiceps* (Santschi) comb. nov. (Argentina); *C. mayri* (Forel) (Paraguay); *C. minuta* sp. nov. (Brasil); *C. panamensis* (Wheeler) comb. nov. (Panamá); *C. reticulata* sp. nov. (Colombia); *C. stenoptera* (Kusnezov) comb. nov. (Argentina); *C. tenua* sp. nov. (Brasil). *Carebara escherichi* COMPLEJO DE ESPECIES: *C. angulata* sp. nov. (Colombia, Ecuador); *C. audita* sp. nov. (Colombia); *C. brasiliana* sp. nov. (Brasil); *C. inca* sp. nov. (Perú); *C. intermedia* sp. nov. (Bélice); *C. kofana* sp. nov. (Colombia); *C. majeri* sp. nov. (Brasil); *C. nuda* sp. nov. Brazil; *C. paya* sp. nov. (Colombia); *C. pilosa* sp. nov. (Brasil); *C. reina* sp. nov. (Colombia); *C. striata* sp. nov. (Colombia, Brasil, Perú) y *C. semistriata* sp. nov. (Colombia). Las combinaciones siguientes se proponen para las especies del Viejo Mundo de *Paedalgus*: *Carebara distincta* (Bolton & Belshaw) comb. nov., *Carebara escherichi* (Forel) comb. nov., *Carebara infima* (Santschi) comb. nov., *Carebara octata* (Bolton & Belshaw) comb. nov., *Carebara pisinna* (Bolton & Belshaw) comb. nov., *Carebara rara* (Bolton & Belshaw) comb. nov., *Carebara robertsoni* (Bolton & Belshaw) comb. nov., *Carebara sarita* (Bolton & Belshaw) comb. nov., *Carebara sudanensis* (Bolton & Belshaw) comb. nov. y *Carebara termitolestes* (Wheeler) comb. nov. Un conocimiento definitivo de la taxonomía de *Carebara* necesita contar con series de colecta más completas, incluyendo hembras, machos y especialmente obreras mayores y menores (en las especies dimórficas). *C. minuta* es una de las especies de hormigas más pequeñas del mundo, con un ancho de cabeza de 0.21 mm and una longitud total ligeramente menor a 1 mm.

Palabras clave. América, hojarasca, hormigas, insectos, Región Neotropical, taxones nuevos.

INTRODUCTION

The definition of the *Carebara* genus group (*sensu* Bolton 2003: tribe Pheidologetini of most classifications), its position within the Solenopsidine tribe group, and the monophyly and relationships of its component genera encompass still-unresolved problems of the systematics and phylogeny of the subfamily Myrmicinae. Ettershank (1966) in his revision of the genera related with *Solenopsis* and *Pheidologeton* presented a brief history of the taxonomy of these allied myrmicine groups and redefined the tribe (as *Pheidologeton* genus-group), reducing it to the genera *Pheidologeton* Mayr, *Oligomyrmex* Mayr, *Carebara* Westwood, *Paedalgus* Forel, *Anisopheidole* Forel and *Lophomyrmex* Emery. Recently, Bolton (2003) put Pheidologetini as junior synonym of their Solenopsidini, in their new arrange of the supraspecific classification of ants. This paper cover the *Carebara* genus group (sensu Bolton 2003) species of America, grouping all in a single genus, *Carebara* Westwood.

The genera *Carebara*, *Oligomyrmex*, *Paedalgus* (and, to a certain extent, *Afroxyidris*) have been considered closely-related taxa (Ettershank 1966, Bolton & Belshaw 1993). As will be discussed below, these groups have much more in common than characters that consistently separate them. In a revision of *Paedalgus* Bolton & Belshaw (1993) pointed out that the separation of *Paedalgus* and *Carebara* is very tenuous, and that eventually both groups might be lumped as a single genus. The synonymy of *Oligomyrmex* and *Carebara* might be more difficult to accept; nevertheless, there are several species (see *Carebara concinna* species-complex below) that form a perfect bridge between the typical monomorphic, tiny *Carebara* and the soldiers or major workers of the typical *Oligomyrmex*. In light of this, the taxon *Oligomyrmex* is in a precarious state; on the basis of available information, the best option appears to be to consider the genus a junior synonym of *Carebara*. By similar logic, the genera synonymized by Ettershank (1966) with *Oligomyrmex* must be included as well, since they do not possess attributes that separate them convincingly from *Carebara* s.l.

I propose *Afroxyidris* provisionally as junior synonym of *Carebara*. *Afroxyidris* is a monotypic genus (Belshaw & Bolton 1994); although there are some autoapomorphic characteristics, there are nevertheless insufficient differences to separate it from the new generic concept of *Carebara*.

MATERIALS AND METHODS

Measurements were made using a Nikon SMZ 2T stereomicroscope at 80X magnifications and a fiber ring lamp. All measurements in mm: HL -

Head length: Maximum length, in full face view, from the apex of the clypeal bidentate plate to middle of vertex; HW - Head width: Maximum width in full face view (in males including eyes); SL - Scape length (exluding basal condyle), in straight line distance; PW - Pronotal width; WL - Weber length (as proposed in Kugler 1994); GL - Gaster length; TL - Total length; CI - Cephalic index: HW/HL; SI - Scape index: SL/HW. Sex, castes, etc., are abbreviated as follow: l = larva, f= female, q =queen, s = soldier and w = worker.

Collections

BMNH. Natural History Museum, London, England.

CWEM. William and Emma MacKay Collection, University of Texas, El Paso, Texas, USA.

CEPLAC. Centro de Pesquisas do Cacau, Comisão do Plano de Lavoura, Itabuna, Bahia, Brazil.

IAvH. Insect Collection, Instituto Humboldt, Claustro de San Agustín, Villa de Leyva, Colombia.

ICN. Insect Collection, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia.

INBio. Instituto Nacional de Biodiversidad, San José, Costa Rica.

JTL. John T. Longino Collection, Evergreen College, Washington, USA.

LACM. Los Angeles County Museum of Natural History, Los Angeles, USA.

MCZ. Museum of Comparative Zoology, Harvard University, Cambridge, USA.

MIZA. Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela.

MZSP. Museu de Zoologia, Universidade de São Paulo, Brazil.

PSW. Phillip S. Ward Insect Collection, University of California, Davis, USA.

USNM. United States National Museum of Natural History/Smithsonian Institution, Washington D.C., USA.

RESULTS

Synonymic list in the genus *Carebara*

Carebara Westwood, 1840
= *Oligomyrmex* Mayr, 1867 syn. nov.
= *Aeromyrma* Forel, 1891 syn. nov.
= *Aneleus* Emery, 1900 syn. nov.
= *Erebomyrma* Wheeler, 1903 syn. nov.
= *Paedalgus* Forel, 1911 syn. nov.
= *Lecanomyrma* Forel, 1913 syn. nov.
= *Spelaeomyrmex* Wheeler, 1922 syn. nov.
= *Hendecatella* Wheeler, 1927 syn. nov.
= *Solenops* Karawajew, 1930 syn. nov.
= *Sporocleptes* Arnold, 1948 syn. nov.
= *Crateropsis* Patrizi, 1948 syn. nov.
= *Nimbamyrma* Bernard, 1953 syn. nov.
= *Afroxyidris* Belshaw & Bolton, 1994 syn. nov. (Provisional).
= *Neoblepharidatta* Sheela & Narendran, 1997 syn. nov.

Synonymic list of Western Hemisphere *Carebara*

Carebara concinna species complex:

C. longii (Wheeler, 1903) comb. nov. USA (w, m)
C. peruviana (Emery, 1906) comb. nov. Perú (f)
C. urichi (Wheeler, 1922) comb. nov. México to Brazil (w, s, m, f)
= *Spelaeomyrmex urichi* Wheeler, 1922
= *Erebomyrma urichi* (Wheeler, 1922)
= *Oligomyrmex urichi* (Wheeler, 1922)
= *Erebomyrma nevermanni* Mann, 1926 syn. nov.
= *Oligomyrmex nevermanni* (Mann, 1926)
= *Erebomyrma morai* Menozzi, 1931 syn. nov.
= *Oligomyrmex morai* (Menozzi, 1931)
= *Erebomyrma eidmanni* Menozzi, 1936 syn. nov.
= *Oligomyrmex eidmanni* (Menozzi, 1936)
C. brevipilosa sp. nov. Costa Rica to Brazil

Carebara lignata species complex:

C. anophthalma (Emery, 1906) Brazil, Ecuador, Guyana (w, q, m, f)
= *Oligomyrmex anophthalmus* Emery, 1906
= *C. winifredae* Wheeler, 1922 syn. nov.
C. bicarinata Santschi, 1912 French Guiana
C. bruchi (Santschi, 1933) comb. nov. Argentina (w, s)
= *Oligomyrmex bruchi* Santschi, 1933
= *Erebomyrma bruchi* (Santschi, 1933)
C. coeca sp. nov. Brazil, Colombia (w, s, q, m)
C. elongata sp. nov. Colombia (w)
C. globularia sp. nov. Colombia (w)
C. incierta **n.n**. Brazil (m). New name for *incerta* Santschi, 1923, preoccupied by *Carebara* (=*Oligomyrmex*) *incerta* (Santschi, 1919) [Zimbabwe] (new combination proposed in the Appendix).
C. longiceps (Santschi, 1929) comb. nov. Argentina (w, m)
= *Oligomyrmex longiceps* Santschi, 1929
= *Erebomyrma longiceps* (Santschi, 1929)
C. mayri (Forel, 1901) Paraguay (m)
= *Tranopelta mayri* Forel, 1901
C. minuta sp. nov. Brazil (w)
C. panamensis (Wheeler, 1925) comb. nov. Panamá (w, s)
= *Oligomyrmex panamensis* Wheeler, 1925
= *Erebomyrma panamensis* (Wheeler, 1925)
C. reticulata sp. nov. Colombia (w)
C. stenoptera (Kusnezov, 1952) comb. nov. Argentina (f)
= *Oligomyrmex stenopterus* Kusnezov, 1952
= *Erebomyrma stenoptera* (Kusnezov, 1952)
C. tenua sp. nov. Brazil (w)

Carebara escherichi species complex:

C. angulata sp. nov. Colombia, Ecuador (w)
C. audita sp. nov. Colombia (w)
C. brasiliana sp. nov. Brazil (w)
C. inca sp. nov. Perú (w)
C. intermedia sp. nov. Belice (w)
C. kofana sp. nov. Colombia (w)
C. majeri sp. nov. Brazil (w)
C. nuda sp. nov. Brazil (w)
C. paya sp. nov. Colombia (w)
C. pilosa sp. nov. Brazil (w)
C. reina sp. nov. Colombia (w)
C. striata sp. nov. Colombia, Trinidad, Brazil, Perú (w)
C. semistriata sp. nov. Colombia (w)

Genus *Carebara* Westwood

Carebara Westwood, 1840:86. Type species: *Carebara lignata* Westwood, 1840:85, by monotypy.

Oligomyrmex Mayr, 1867:110. Type species: *Oligomyrmex concinnus* Mayr, 1867:111, by monotypy. syn. nov.

Aeromyrma Forel, 1891:198. Type species: *Aeromyrma nosindambo* Forel, 1891:199, by monotypy [Subgenus of *Oligomyrmex*: Emery, 1915:59; revived as genus: Arnold, 1916:256; mantained as genus: Wheeler, 1922a:882; subgenus of *Oligomyrmex*: Emery, 1922:215; junior synonym of *Oligomyrmex*: Ettershank, 1966:119]. syn. nov.

Aneleus Emery, 1900:327 [As subgenus of *Pheidologeton*]. Type species: *Solenopsis similis* Mayr, 1862:751, by designation of Wheeler, 1911:158 [Raised to genus: Emery, 1914a:41; maintained as genus: Arnold, 1916:254; Forel, 1917:243; Wheeler, 1922a:663; Emery, 1922:213. Senior synonym of *Sporocleptes*: Consani, 1951:169; Arnold, 1952:460. Junior synonym of *Oligomyrmex*: Ettershank, 1966:119]. syn. nov.

Erebomyrma Wheeler, 1903:138. Type species: *Erebomyrma longii* Wheeler, 1903:140, by monotypy [Senior synonym of *Spelaeomyrmex*: Wilson, 1962:63; junior synonym of *Oligomyrmex*: Ettershank, 1966:119; revived as valid genus: Wilson, 1986:61; returned to synonymy of *Oligomyrmex*: Bolton, 1994:106]. syn. nov.

Paedalgus Forel, 1911:217. Type species: *Paedalgus escherichi* Forel, 1911:218. syn. nov.

Lecanomyrma Forel, 1913:56 [As subgenus of *Pheidologeton*]. Type species: *Pheidologeton* (*Lecanomyrma*) *butteli* Forel, 1913:56, by monotypy [Subgenus of *Aneleus*: Emery, 1922:215; junior synonym of *Oligomyrmex*: Ettershank, 1966:119]. syn. nov.

Spelaeomyrmex Wheeler, 1922b:9. Type species: *Spelaeomyrmex urichi* Wheeler, 1922:45, Fig. 1, by original designation (Junior synonym of *Erebomyrma*: Wilson, 1962:63]. syn. nov.

Hendecatella Wheeler, 1927:93 [As subgenus of *Oligomyrmex*]. Type species: *Oligomyrmex* (*Hendecatella*) *capreolus* Wheeler, 1927:93, by monotypy [Junior synonym of *Oligomyrmex*: Ettershank, 1966:119]. syn. nov.

Solenops Karavaiev, 1930:207 [As subgenus of *Solenopsis*]. Type species: *Solenopsis* (*Solenops*) *weyeri* Karavaiev, 1930:207, by monotypy [Junior synonym of *Oligomyrmex*: Ettershank, 1966:119]. syn. nov.

Sporocleptes Arnold, 1948:219. Type species: *Sporocleptes nicotiana* Arnold, 1948:219, by monotypy [Junior synonym of *Aneleus*: Consani, 1951: 169; Arnold, 1952:460; junior synonym of *Oligomyrmex*: Ettershank, 1966:119]. syn. nov.

Crateropsis Patrizi, 1948:174 [As subgenus of *Solenopsis*]. Type species: *Solenopsis* (*Crateropsis*) *elmenteitae* Patrizi, 1948:174, by monotypy [Junior synonym of *Oligomyrmex*: Ettershank, 1966:120]. syn. nov.

Nimbamyrma Bernard, 1953:240. Type species: *Nimbamyrma villiersi* Bernard, 1953:241 [Junior synonym of *Oligomyrmex*: Ettershank, 1966:120]. syn. nov.

Afroxyidris Belshaw & Bolton, 1994:631. Type species: *Afroxyidris crigensis* Belshaw & Bolton, 1994:632, by original designation. syn. nov. (Provisional).

Neoblepharidatta Sheela & Narendran, 1997:88. Type species: *Neoblepharidatta nayana*, by original designation [Junior synonym of *Oligomyrmex*: Bolton, 2003:216]. syn. nov**.**

Generic diagnosis. Dimorphic to secondarily monomorphic myrmicine ants with the following combination of characters:

Workers. Mandibles with four to six teeth in the masticatory border, which decrease in size from the apical (two teeth in *Afroxyidris*). Anterior clypeal margin without central isolated seta. Anterior border of clypeus usually with four distinct setae. Palp formula 2,2. Antennae with 11 segmented or less (never less than 8). Antennal club 2-segmented, the apical segment larger. Eyes present and reduced or absent. Frontal carinae and antennal scrobes absent. Propodeal lobes small. Sting functional. Workers dimorphic or monomorphic. Major with lateral sides of head right, posterior side strongly bilobed. Mandibles massive, with teeth loosely defined, basal and masticatory margins in about right angles. Alitruncal (mesosomal) segmentation variously developed, sometimes very similar to gynes, with metanotum narrow, clearly produced in lateral view.

Queens. Noticeable larger than minor workers. Palp formula 3,2. Mesosoma fully segmented. Gaster long, robust. Wings with Marginal Cell closed by *Rs* curving to meet *R*.

Males. Antennae 13 segmented, with pedicel short and scape subcylindrical. Clypeus slightly to distinctly swollen. Mandibles with 3 teeth. Notauli absent, parapsidial furrows faint to distinctly impressed. Genitalia, notably exserted. Wings venation as gyne.

Carebara, as conceived here, appears to be a broad and heterogeneous genus, with some species placed in *Oligomyrmex* clearly different from *Carebara* s. str. In *Oligomyrmex*, there are unambiguously two castes, major and minor worker, whose sizes and forms are obviously different. Wilson (1971, 1985b) and Hölldobler and Wilson (1990) reviewed the evolution of ant castes and suggested that in *Oligomyrmex*, as well as in *Acanthomyrmex* and some *Pheidole* and other groups, the "intermediate" worker caste disappeared at some point during their evolution. This implies that the ancestral forms of these groups were probably polymorphic. With this line of reasoning, it seems possible that the disappearance of the intermediate worker is an evolutionary advance that might have occurred in the *Carebara* + *Paedalgus* + *Afroxyidris* lineage.

In a study of the tribe "Pheidologetonini" (=*Carebara* genus group *sensu* Bolton 2003, Fernández, unpublished) the genera *Pheidologeton*, *Oligomyrmex* and *Carebara* s.l. form a compact group, defined, in part, by the configuration of clypeus, palps and antennae. The groups in question appear to be a polymorphic-dimorphic-monomorphic cline corresponding to *Pheidologeton* – *Oligomyrmex* – *Carebara* + *Paedalgus* (and probably *Afroxyidris*). There are no morphological characters that can clearly separate these groups. The *Carebara* + *Paedalgus* clade appears to be monophyletic, but *Oligomyrmex* still remains paraphyletic. Furthermore, the *Oligomyrmex* + *Carebara* group (which can be defined by the loss of the intermediate caste) still leaves *Pheidologeton* as a paraphyletic. Kugler (1986) in his study of the sting apparatus in the Pheidologetonini, affirmed that "*Pheidologeton* and *Oligomyrmex* are closely related, *Pheidologeton pygmaeus* is closer to *Oligomyrmex* than to *Pheidologeton*". Although Kugler did not include *Carebara* or *Paedalgus* in his analysis, it is probable that the sting apparatus of these ants is included in the definition given for *Pheidologeton* and *Oligomyrmex*. The observation that *P. pygmaeus* is closer to *Oligomyrmex* than to other *Pheidologeton* is interesting. Synonymy of *Pheidologeton* and *Carebara* appears inevitable.

The genus *Oligomyrmex* might be maintained for practical reasons. These species can be visually distinguished from *Carebara* and *Paedalgus*. The "typical" minor workers have eyes, sculptured mesosoma, and propodeum with teeth or marked angles [In *Carebara*: eyes absent, sculpturing absent or greatly reduced, propodeum simple]. Nevertheless, there is a group of *Oligomyrmex* whose minor workers are indistinguishable from *Carebara*: *Oligomyrmex panamensis*, *O. bruchi*, and the species described here as *coeca*, which might be considered *Oligomyrmex* following the limits proposed by Ettershank (1966) for the genus. These species are characterized by 9-segmented antennae, major workers with typical *Oligomyrmex* major worker modifications and minor workers that are eyeless and lacking typical *Oligomyrmex* sculpturing or pilosity; these minor workers are indistinguishable from typical *Carebara*. This group of species thus comprises a natural bridge between *Carebara* and *Oligomyrmex*, in which it is difficult to point to a clear limit between the two genera. On the basis of solely minor workers, any of these species would be identified as *Carebara*; on the basis of just soldiers, the identification would be *Oligomyrmex*. The new species *C. intermedia* (see description and comments under this species) is remarkable by the posession of mixed traits of *Oligomyrmex* and *Paedalgus* workers.

By extending the limits of *Carebara*, the synonymy of *Paedalgus* becomes inevitable; this step was suggested by Bolton & Belshaw (1993) in their revision of this genus. As these authors pointed out, the differences between the genera are minor and do not merit generic status. Nevertheless, within *Carebara*, the *Paedalgus* species form a compact group (based on head form and short propodeum) for which I propose the creation of a species complex (but see *C. intermedia* below).

The broad concept of *Carebara* justifies the synonymies proposed by Ettershank (1966) with respect to *Oligomyrmex*, with the exception of *Octella*, which is now considered synonymous with *Solenopsis* (Taylor 1991, Bolton 1995). Even so, this leaves a genus whose status is still not clear: *Nimbamyrma*. This genus was described by a species collected in Guinea (Africa) (Bernard 1953). The author referred to additional material from Angola under study. Several characteristics indicate this taxon as congeneric with *Carebara*: 11-segmented antennae, with a 2-segmented club; form of the clypeus; and configuration of the thorax, petiole, post-petiole, and gaster. There was no mention of the palpal formula, a critical character in the Pheidologetonini tribe. There are two unusual characters for *Carebara* (and of the tribe in general): mandibles with 5-6 obtuse teeth and a second pair of teeth on the propodeum. *Carebara*, *Oligomyrmex* and *Paedalgus* workers normally have 4-toothed mandibles (sometimes with the basal one reduced), and only the females have 5 blunt, well-delimited teeth. Bernard's (1953) Figure 12D of *Nimbamyrma villiersi* shows several teeth and denticles; perhaps more than 4 is an apomorphy of these species. More difficult to manage is the second pair of teeth in the propodeum. These are conspicuous and well-developed, and call to mind other groups of Myrmicinae. For the moment and until there is a more complete redescription of the taxon that includes palpal formula, these teeth (and tooth number) can be assumed to be another apomorphic character of the species.

The location of *Afroxyidris* remains problematical. Belshaw & Bolton (1994) placed the genus within Pheidologetonini and considered *Carebara* to be the genus nearest to it. Although *Afroxyidris crigensis* is highly apomorphic, it might be considered a group of species within *Carebara*. The discovery of the sexual forms and, possibly, major workers, should they exist, could confirm the taxonomic position of the genus as proposed here.

Neoblepharidatta is placed as junior synonym here, as logical step following the synonymization of this name under *Oligomyrmex* (Bolton 2003:216). Bolton (2003:273) offer more details.

Taxonomy of American species

According to the classificiation proposed here, the only know genus for America is *Carebara*, with approximately 30 species distributed from the USA to Argentina. The great majority of the species are Neotropical. The study of these species (as of all in the genus) is greatly limited by isolated descriptions of females and males, and the poor descriptions of workers. The latter problem is especially acute with reference to the tiny minor workers of the genus, which are fairly uniform morphologically and moreover rarely greater than 1.20 mm in length. For this reason, the user should keep in mind that some future associations of sexes and castes, from nest samples, might change the number and limits of the species proposed below.

Provisional key for the Western Hemisphere species-complexes in *Carebara* (workers)

1. Antennae with 11 segments; workers with eyes or ommatidia present; all castes usually with propodeum armed ....*Carebara concinna* species complex

1’. Antennae with 9 segments; workers always with propodeum unarmed 2

2. Minor workers with ommatidia; propodeum short (Figure 8); major absent or unknown .... *Carebara escherichi* species complex

2’. Minor workers always eyeless; propodeum normal (Figures 4, 5); majors absent or present .... *Carebara lignata* species complex

As pointed out below, the *escherichi* complex is the only clearly monophyletic group, since its definition includes all known species (except perhaps *C. intermedia*). In this complex, major workers are unknown, although it would not be surprising ultimately to discover some, since this has occurred in typical *Carebara* (*C. concinna* species complex).

The *concinna* and *lignata* complexes correspond to the concepts of *Oligomyrmex* and *Carebara sensu* Ettershank (1966). As defined here, the separation of the *Carebara* with 11 antennal segments in one set and those with 9 in another results in artificial groups, since both are para- or polyphyletic. New species as *C. coeca* or *C. tenua* contains majors indistinguishables from *Oligomyrmex* majors and minors indistinguishable from *Carebara* workers. A definitive arrangement of the groupings and complexes of *Carebara* awaits a worldwide revision of the genus that will include the rich Old World faunas.

Carebara concinna species complex

Diagnosis of American species: *Workers*. Dimorphic. The minor workers very small; the major workers with massive heads and more larger than workers. Antennae 11 segmented (11 to 9, rarely 8 segmented in Old World species) with club 2-segmented. Mandibles with 4 or 5 teeth. Eyes present in majors, reduced in minor workers. Metanotal groove well developed. Propodeum armed with teeth, triangles or angulations. *Queens*. Strongly larger than workers. Antennae 10 segmented, the apical segments thicker than basal segments. Palps 3,2. Basal segment of the maxillary palp elongated laterally. Mandibles with 4-6 teeth. Propodeum armed. Postpetiole very broadly attached to the gaster. *Males* (Ettershank 1966): “Genitalia not fully retractile, about half exserted; parameres small, tips setose; aedeagus flattened, deep, ventrally dentate; digit rod-like, tips hooked, heavily sclerotized”.

Key to the species of *Carebara concinna* species complex (workers). The worker of *C. peruviana* is unknown.

1. Head and promesonotum smooth and shining, devoid of any conspicuous sculpturation; soldier unknown; USA .... *C. longii* (Wheeler)

1’. Head and promesonotum with sculpture feebly or strongly marked, always present; soldier with heavy longitudinal rugulation over head; Neotropics 2

2. Pronotal dorsum mainly reticulate, without longitudinal rugulae or very few; hind tibia with short appresed pubescence .... *C. brevipilosa* sp. nov.

2’. Pronotal dorsum mainly longitudinally rugose, sometimes smooth and shining with a few longitudinal rugulae; hind tibia with longer suberect to erect pilosity (longer hairs about 80% or more the length of maximum tibial diameter) .... *C. urichi* (Wheeler)

Carebara longii (Wheeler) comb. nov.

(Figs. 1,10)

Erebomyrma longii Wheeler, 1903:140 (w, q, m); Wilson, 1986:61.
Oligomyrmex longii (Wheeler): Ettershank, 1966:123; Bolton, 1995:299.

Worker measurements Lectotype (here designated): HW 0.48 HL 0.60 SL 0.32 PW 0.29 WL 0.55 GL 0.64 TL 2.13 CI 79 SI 68.

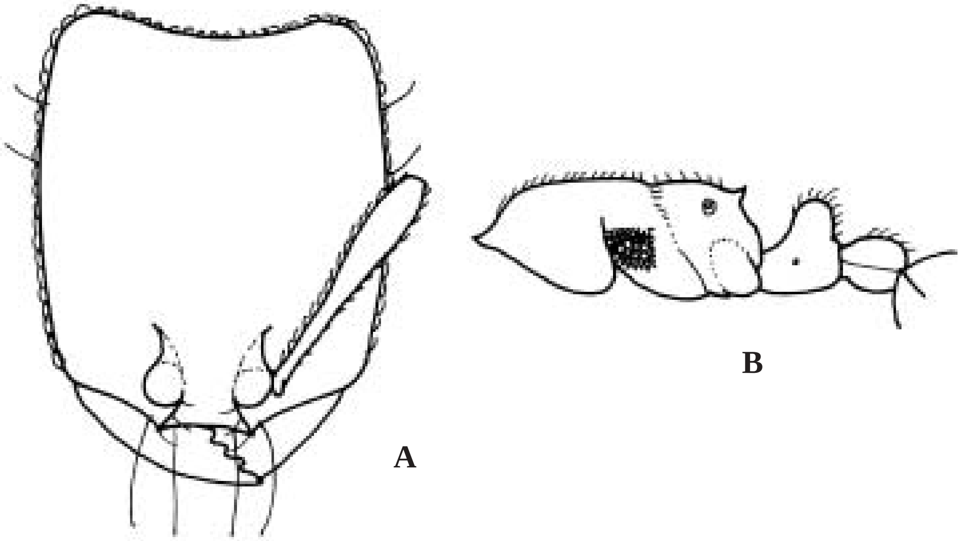

Figure 1. *Carebara longii* worker: A, head in full face view (HW 048 mm); B, lateral view of mesosoma, petiole and postpetiole (WL 055 mm). In B, square show sculpturation.

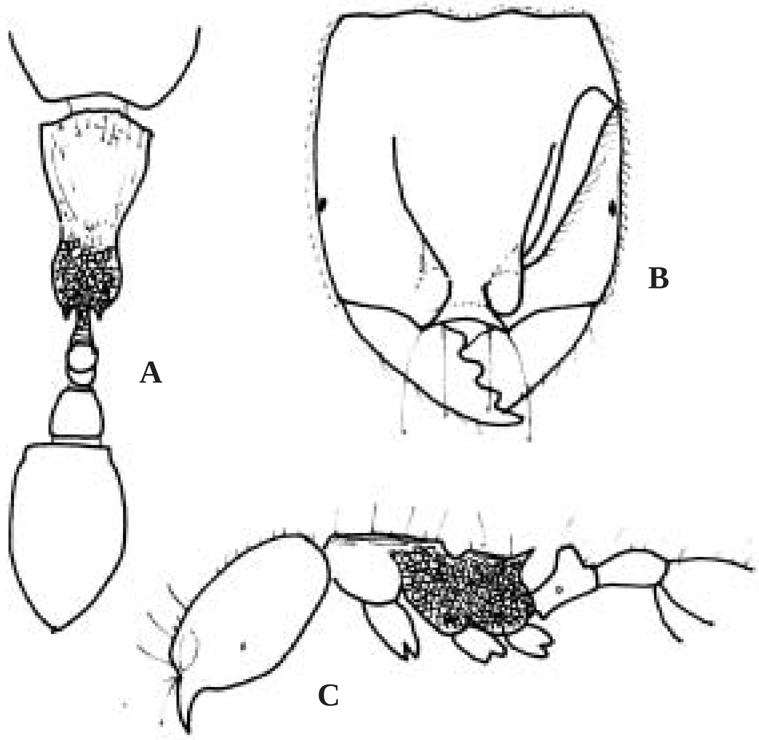

Figure 2. *Carebara urichi* worker: A, dorsal view mesosoma & metasoma (WL 044 mm): B, Head, full face view (HW 040 mm); C, lateral view (WL 044 mm).

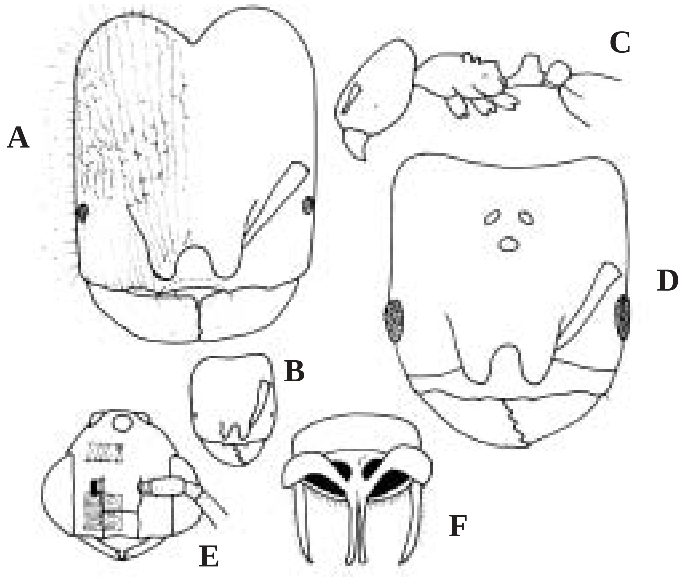

Figure 3. *Carebara urichi*: A & B, full face views of heads of major and minor workers, at same scale (HW major: 1.18 mm; HW minor: 040 mm); C, side view of major (WL 1.10 mm); D, full face view of female (HW 1.18 mm); E, full face view of male (HW, including eyes: 078 mm); F, posterior view of male genitalia.

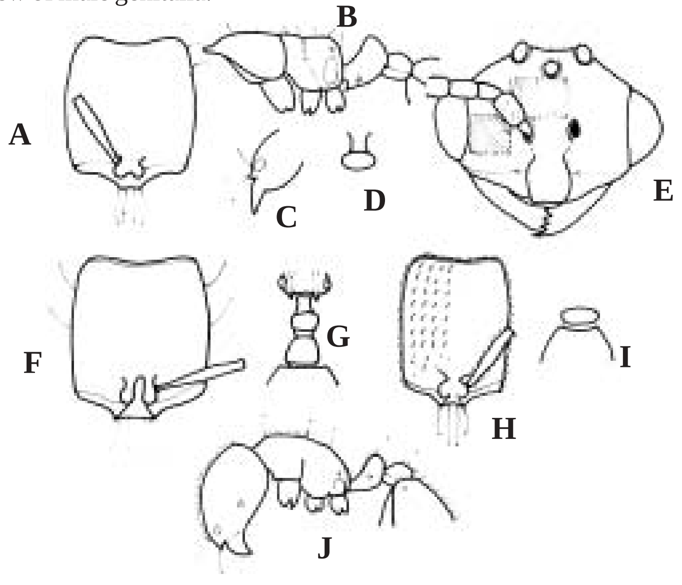

Figure 4. *Carebara* spp., workers (except E, male). A-E: *C. longiceps*. A, head in full face view (HW 025 mm); B, mesosoma, lateral view (WL 031 mm); C, lateral view of head, showing the proyected setae; D, petiole in dorsal view; E, male head in full face view (HW 075 mm). F-G: *C. globularia*. F, Head in full face view (HW 024 mm); G, petiole and postpetiole in full face view. H-I: *C. elongata*. H, head in full face view (HW 021 mm); I, postpetiole and first tergum in dorsal view. J: *C. inca*, lateral view (WL 030 mm).

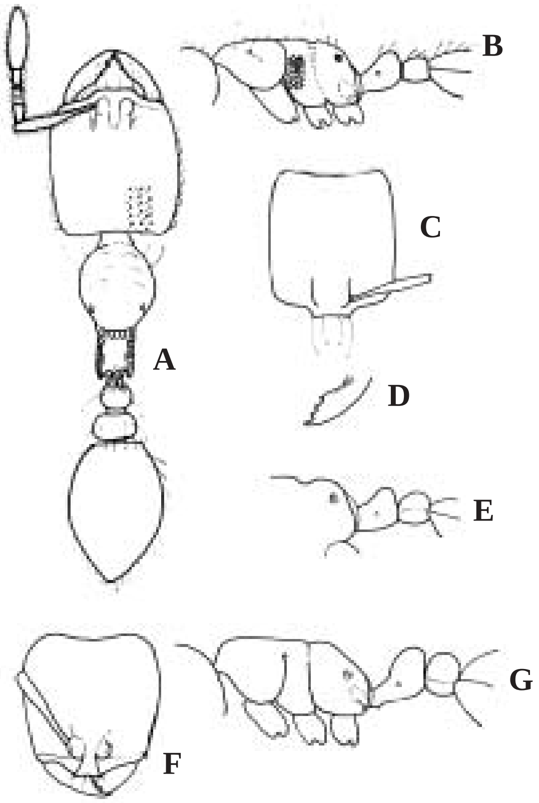

Figure 5. *Carebara* spp., workers. A-E: *C. reticulata* sp.n. A, Dorsal view (WL 035 mm); B, lateral view of mesosoma; C, head, full face view (HW 029 mm) showing the clypeal setation pattern; D, left mandible; E, lateral view, propodeum, paratype worker from Calarcá, Quindío. A-C at same scale, from type worker. F-G: *C. anophthalma*. F, head in full face view (HW 031 mm); G, lateral view of mesosoma (WL 038 mm).

Head slightly longer than wide. Posterior border concave, lateral sides slightly convex. Mandibles with 4 teeth. Palps 2,1 (Wheeler 1903). Median portion of clypeus slightly concave. Sides of median portion of clypeus narrowing onto frontal lobes. Frontal triangle poorly defined, best seen in dorsal oblique view. Eyes reduced to one ommatidium, situated anterior to cephalic midline. Antennae 11 segmented with club 2 segmented. Scapes fail to reach the vertexal border in 1/3 of the head length. In side view, alitrunk slightly convex, interrumped by the deep metanotal groove. Promesonotal suture impressed laterally. Mesonotal groove deep and well marked dorsal and laterally. Propodeum armed with small teeth which is hardly longer than broad. Propodeal spiracle relatively small, circular, high and equidistant from base of tooh. Bulla of metapleural gland large. Propodeal lobes reduced to narrow lamellae extended from propodeal tooth downward. Petiole with short peduncle and with well defined, high node; petiolar spiracle at midway of petiolar length. Subpetiolar process produced as strong spine directed forward, spine normally not visible in mounted specimens. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole longer than

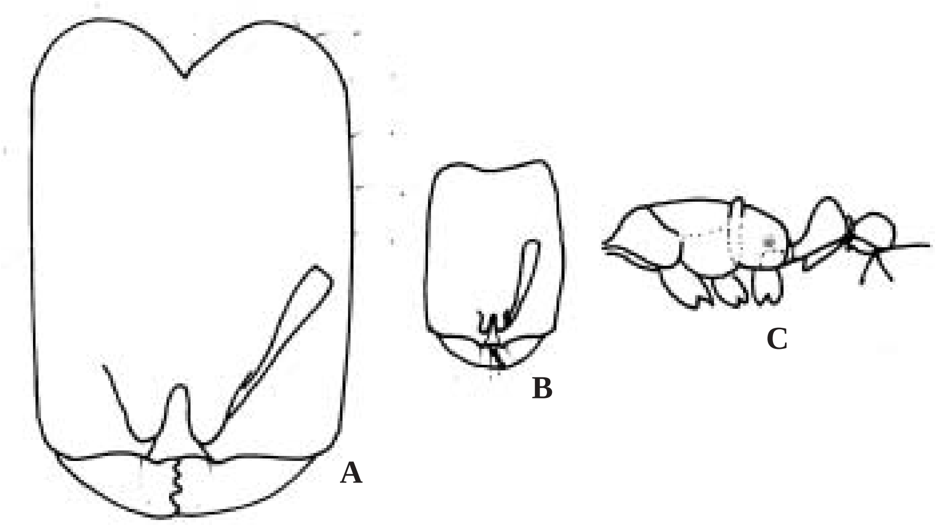

Figure 6. A-C: *C. coeca* sp.n.; A, head of major in full face view (HW 055 mm); B, head of minor worker in full face view (HW 023 mm); C, lateral view of major mesosoma (WL 065 mm). A and B at same scale.

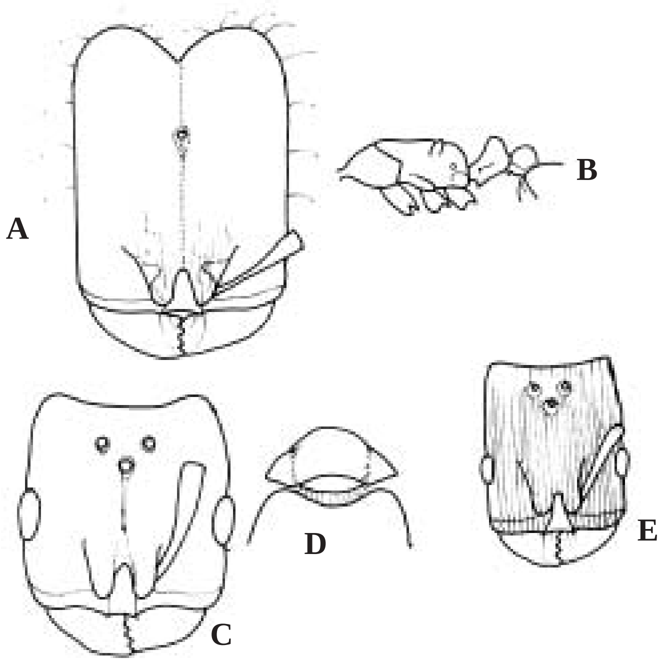

Figure 7. A-B: *C. tenua* sp.n. A face view of major head (HW 066 mm); B, lateral view of mesosoma, major worker (WL 076 mm). C-D: *C. stenoptera*. C, full face view of female head (HW 081 mm); D, petiole and first tergum in dorsal view, female. E: *C. panamensis* cf. female head in full face view (HW 043 mm).

broad and longer than postpetiole. Postpetiole broader than longer and broader than petiole, and campanuliform in posterior oblique view. In dorsal view anterior margin of first tergum straight. Basal portion of first tergum with a shallow cuneate trench. Body smooth and shining. Mandibles with several coarse scattered punctures interspersed with irregular longitudinal carinae feebly impressed. Head densely puncturated (except in the central longitudinal area), each punctum with a small hair. Anterior half of head with a few fine longitudinal rugulae, concentric around antennal receptacles. Sides of alitrunk (except pronotum) and petiole densely rugoso-reticulated, sometimes the sculpturation poorly defined. Short curved hairs (less than 0.04 mm) on head, antennae, mandibles, legs, promesonotum, a few in petiole. Four medium size hairs (about 0.05 mm) on median portion of clypeus. Large hairs (more than 0.07 in length): Four arising from the anterior clypeal margin proyected upward (the external ones) and forward (the internal ones) approaching the mandibular apices; two near the occipital border and one over occipital border, two near the pronotal humeri, two in the promesonotal dorsum, near the posterior magin; several on petiolar and postpetiolar dorsum. All body yellowish.

Paralectotype workers (here designated). UNITED STATES. **Texas:** 3 workers, Denton, 28 sep 1902, *W.H. Long Jr*., LACM and ICN.

Queen. Not seen. Described in Wheeler (1903).

Male measurements paralectotype, here designated, LACM: HW (including eyes) 1.13 HL 0.84 EL 0.41 SL 0.23 PW 1.25 WL 1.25 WL 5.2 GL 2.95 TL 10.11 CI 134 SI 20.

Described in Wheeler (1903) Very similar to the male of *C. longiceps* (Santschi).

Comments. This is the only North American species of *Carebara*, collected in Texas. Wheeler provides description of workers, females and males and offered some biological notes. The description was "[based] from numerous workers and males and four females from Denton, Texas" (Wheeler, 1903:145) and is interesting that the samples collected by Mr. Long were devoid of major workers. *C. longii* were until now put in the genus *Oligomyrmex*, and is intringuing the lack of soldiers in a genus, *Oligomyrmex*, normally characterized by the presence of dimorphic workers. Perhaps the soldiers were not collected or they are true absent in this species.

Carebara peruviana (Emery) comb. nov.

(Fig. 10)

Erebomyrma peruviana Emery, 1906:139 (footnote) (q); Brandão, 1991:343.
Oligomyrmex peruvianus (Emery): Ettershank, 1966:124; Bolton, 1995:300.

From Emery's (1906) description: "Resembles *Erebomyrma longii* Wheeler in color and sculpture. Petiole and lower part of thorax mostly reddish; fine rugae on head and thorax with indistinct punctures behind rugae. Head is parallel-sided, subrectangular, longer than wide. Antennae short, particularly the scape which is barely thickened. Propodeum armed with blunt tooth. Petiole less wide than postpetiole, petiolar node thick, "scame" shaped, depressed above (not hollowed posteriorly, as in *E. longii*); postpetiole transverse oval. Wings as in *E. longii*, the radial cell as in this species, but longer. Length 7 mm, wing length 7 mm".

Not was possible to examine type material for this species, described on the basis of two females collected in Peru. Judging by Emery's meager description, it is reasonable to suppose that these females are in some way associated with *C. longii* and therefore having 11-segmented antennae; the author probably would have mentioned it if they were 9-segmented. From the description, it can also be inferred that the petiole posteriorly is unlike that of *C. longii* or *C. urichi* (concave and with transverse carinae). *C. peruviana* is apparently different from both. The taxonomic status of this species can only be clarified by observing the type specimens.

Carebara urichi **(Wheeler) comb. nov.**

(Figs. 2, 3, 10)

Spelaeomyrmex urichi Wheeler, 1922b:45, Fig.1 (w).
Erebomyrma nevermanni Mann, 1926:103 (w); Wilson, 1986:61. syn. nov.
Erebomyrma morai Menozzi, 1931:271 (w); Brandão, 1991:343. syn. nov.
Erebomyrma eidmanni Menozzi, 1936:47 (w, s, q); Wilson, 1986:61. syn. nov.
Erebomyrma urichi (Wheeler): Wilson, 1962:63.
Oligomyrmex urichi (Wheeler): Ettershank, 1966:124; Bolton, 1995:300.
Oligomyrmex nevermanni (Mann): Ettershank, 1966:124; Bolton, 1995:299.
Oligomyrmex morai (Menozzi): Ettershank, 1966:124; Bolton, 1995:299.
Oligomyrmex eidmanni (Menozzi): Ettershank, 1966:123; Bolton, 1995:299.

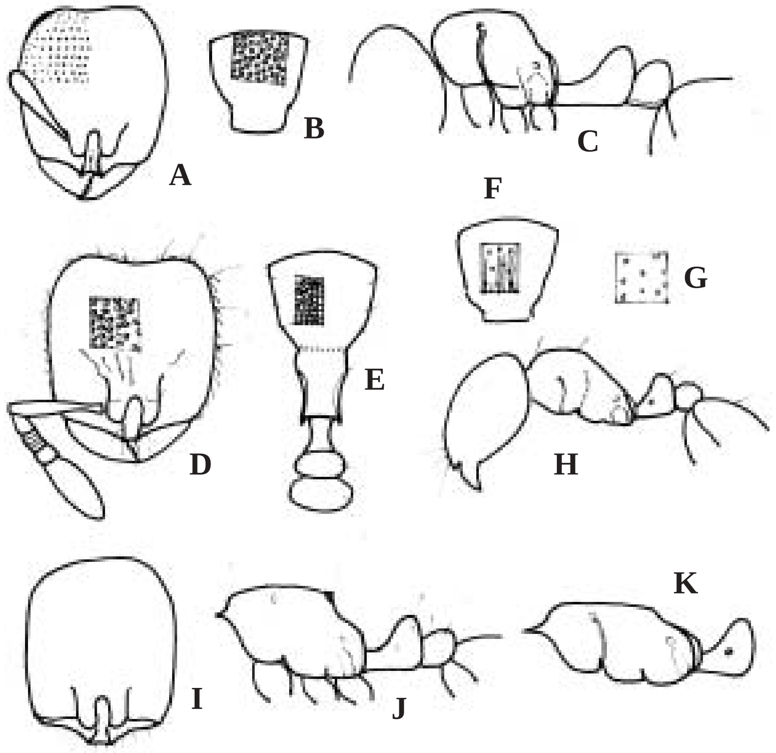

Figure 8. *Carebara* workers. A-C: *C. audita* sp.n. A, head in full face view (HW 028 mm), superior left area showing sculpturation; B, promesonotum in dorsal view, inset showing the sculpturation; C, mesosoma in lateral view (WL 028 mm). D-E: *C. pilosa* sp.n. D, head in full face view (HW 031 mm), inset showing sculpturation; E, dorsal view of mesosoma, petiole and postpetiole, inset showing sculpturation. F-H: *C. striata* sp.n. F, dorsal view of promesonotum (PW 020 mm), inset showing sculpturation; G, pits on promesonotum; H, lateral view (WL 029 mm). I: *C. nuda* sp.n., head in full face view (HW 029 mm). J. *C. angulata* sp.n. mesosoma in lateral view (WL 029 mm). K: *C paya* sp.n., mesosoma in lateral view (WL 029 mm).

Worker measurements (n=12): HW 0.38 – 0.44 HL 0.41 – 0.50 SL 0.26 – 0.30 PW 0.25 – 0.27 WL 0.40 – 0.52 GL 0.39 – 0.47 TL 1.53 - 1.84 CI 88 - 90 SI 68 - 70.

Head slightly longer than wider. Posterior border sinuous, lateral sides slightly convex. Mandibles conspicuous with four stout teeth. Median portion of clypeus slightly concave and on each side with a tooth. Sides of median portion of clypeus narrowing onto frontal lobes and extending somewhat beyond the eyes level as a fine rugulae. Frontal triangle poorly defined. Eyes reduced to a one ommatidium, situated anterior to cephalic midline. Antennae 11-segmented with club 2-segmented. Scapes fail to reach the vertexal border in 1/4 of the head length. In side view, promesonotum nearly flat. In dorsal view, pronotum with humeral angles. Each propleura with a short transverse crest or carina, visible in side view as acute or blunt triangle. Metanotal groove deep. Propodeum low, armed with acute teeth protected upward and backward. Propodeal spiracle relatively small, circular, high and equidistant from base of tooh. Bulla of metapleural gland large. Propodeal lobes reduced to narrow lamellae extending from propodeal tooth downward. Petiole with short peduncle and with well-defined, high node; petiolar spiracle midway of petiolar length. Subpetiolar process produced as small spine directed forward, spine normally not visible in mounted specimens. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole longer than broad and longer than postpetiole. Postpetiole in dorsal view trapezoidal. In dorsal view anterior margin of first tergum straight. Body smooth with some areas shining. Mandibles with several coarse scattered punctures. Head broadly reticulate and punctate (except central area, smooth and shining). Promesonotum and sides of pronotum with some irregular longitudinal rugulae feebly to strongly impressed, sometimes meshed with partial reticulation, sometimes only promesonotum reticulated. Sides of alitrunk (except pronotum) and propodeum densely reticulated. Dorsum of petiole and postpetiole smooth and shining. Short curved hairs (less than 0.08 mm) over head, antennae, mandibles, promesonotum, a few in petiole and gaster; those of head slender and reclining. Long hairs (more than 0.08 mm in length): Four arising from the anterior clypeal margin proyected upward (the external ones) and forward (the internal ones) approaching the mandibular apices; two rows of 3-4 in the head; about 18-20 on promesonotal dorsum, about 4 over propodeal dorsum; four in petiole, four in postpetiole, several on gaster. Hind tibia with erect, long hairs. Entire body yellowish ferruginous.

Major worker measurements (Undescribed): HW 1.16 – 1.39 HL 1.31 – 1.75 SL 0.53 – 0.57 EL 0.11 PW 0.60 WL 1.05 1.29 GL 1.26 – 1.54 TL 4.55 – 5.58 CI 80 - 89 SI 41 - 46

Body massive, notoriously larger than worker. Head rectangular, posterior border cordate shaped, sides straight, parallel. Mandible stout, masticatory border straight, forming an angle about 90° with basal border. Masticatory border with teeth poorly defined. Dorsal clypeal blade at angle with ventral side. Clypeus narrow, medial portion slightly concave. Frontal triangle well defined. Frontal lobes somewhat continued posteriorly as longitudinal rugulae. Scapes short, barely extending 1/2 the head length. Eyes minute but clearly visible, with about 6 ommatidia in their maximun diameter. Mesosoma modified: promesonotum slightly convex, scutellum well differentiated, metanotum very narrow, separated from scutellum and propodeum. In dorsal view, promesonotum with a deep groove of inverted-V shape. Dorsal face of propodeum very reduced, abruptly sloping downwards, flanked by two carinae continued as blunt propodeal angulations. Propodeal spiracle large, rounded.

Petiolar configuration as worker. Posterior side of petiole concave. Postpetiole broader than larger, in posterior view campanuliform. Head and thorax with coarse longitudinal rugulae. Declivity phase of propodeum with feebly transverse carinae. Dorsal face of petiolar peduncle and anterior face of petiole with dense fine reticulation. Sides of petiole with transverse rugae. Posterior side of petiole with coarse transverse rugae. Postpetiole dorsum with irregular longitudinal rugae feebly impressed. Body with short erect and dense to medium erect pilosity. Body brown, appedanges lighter.

Queen measurements (Undescribed) (n=2): HW 1.17 – 1.18 HL 1.15 – 1.25 SL 0.51 – 0.56 EL 0.24 – 0.25 WL 1.69 - 1.75 GL 1.93 TL 6.02 – 6.06 CI 95 - 100 SI 44 - 47.

General habitus as soldier with several differences: Posterior border of head slightly concave. Mandible with 5 tooth, with a space between subapical and remainder. Eyes big, bulging. Three ocellae present. Mesosoma modified as in myrmicine queens. Metanotum sharply defined. Propodeum armed with triangular teeth. Propodeal spiracle big, round, backward. Subpetiolar process well-defined. Sculpture and general pilosity as soldier.

Male measurements (Undescribed): HW 0.78 HL 0.63 SL 0.14 EL 0.34 WL 1.33 GL 1.17 TL 3.81 CI 124 SI 18.

Head subsphaerical. Eyes large. Mandibles narrow, not touching when closed, with two teeth, the apical twice as big as basal. Clypeus medially bulging. Ocellae turreted, the frontal round and prominent. Mesosternum bulging. Propodeum unarmed. Petiole larger that postpetiole, their peduncle running evenly in the dorsal face of node. Petiole ventrally without subpetiolar process, and with several irregular longitudinal carinae. Postpetiole low, broadly attached to the gaster. Genitalia strongly protruding, with aedeagus and parameres long and narrow. Body smooth and shining. Posterior half of head with transverse striation, anterior half more or less longitudinal striate. Most of promesonotum striato-punctate. Mesosoma punctate. Body dark brown, appendanges lighter. Wings dark.

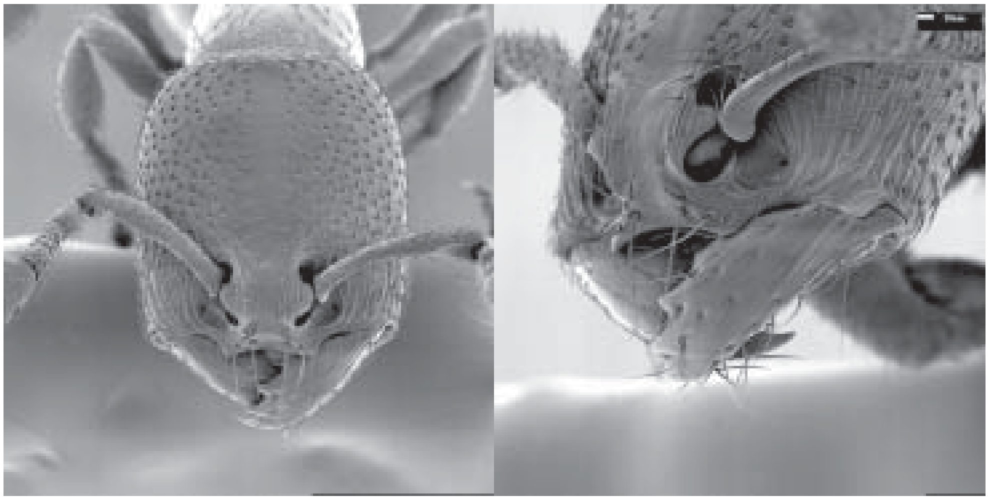

Figure 9A,B. *Carebara reticulata* sp.n. (worker). A. Head in full face view (left); B. Clypeal mandibular area in dorsal oblique view (right).

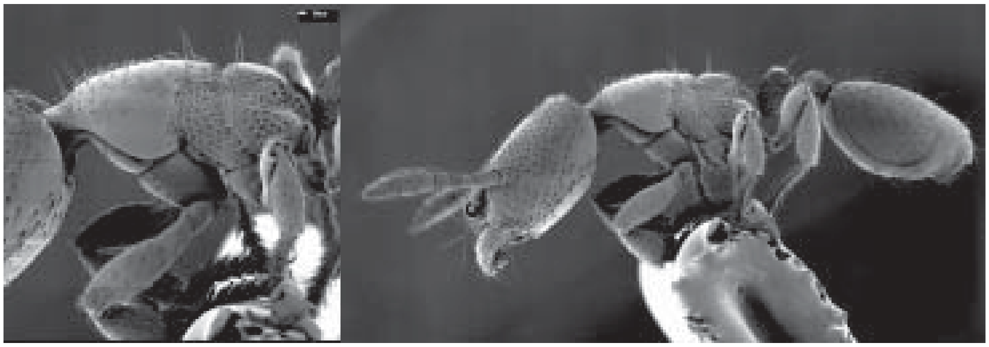

Figure 9C,D. *Carebara reticulata* sp.n. (worker). C. Mesosoma in lateral view (left). D. Body in lateral view (right).

Material examined. BELICE. 3 workers, Millionaria, 2 mar 1995, *Lyal & Hollis leg*., ICN. BRAZIL. **Amapá:** 3 workers, Serra do Navio, stomach cont. No. M31 from *Phyllobates pictus*, *Silverstone*, LACM; **Bahía:** 6 workers, Ilhéus, 17 abr 1994, *J. Nascimento No. 4840*, CEPLAC; **Mato Grosso:** 1 worker, Itaum, 11.1974, *M. Alvarenga No. 10891*, MZSP; idem, 5 worker, Livramento, in “Cerrado”, “partial colony in leaf litter”, 6 feb 1985, *J.C. Trager No. 05611*, MZSP; **Pará:** 5 worker, Bélem, 24 nov 1953, MZSP; **Rio de Janeiro:** 1 queen, Mendes, 3 oct 1933, *Eidmann*, MZSP; idem, 3 workers, 15 mar 1954, *T. Borgmeier*, MZSP; **São Paulo:** 6 workers, Agudos, 23 feb 1955, *W.W. Kempf*, MZSP (3), LACM (3); idem, 3 workers, Agudos, 28 dic 1955, *C. Gilbert No. 1561*, MZSP; idem, 4 workers, Agudos, mar 1960, *C. Gilbert No. 5250*, MZSP; idem, 1 worker, Itirapina, Estacão Exp., 14 abr 1989, *Diniz*, MZSP; idem, 4 workers, [Illegible data], Fzda. Baveri (?, 23 mar 1976, *Diniz No. 979*, MZSP. COLOMBIA. **Amazonas:** 1 worker, Amacayacu National Park, Mata Mata Creek, °46’38”S 70°15’57”W, pitfall trap, 14 jul 2000, *A. Parente, sample No. 725*, IAvH; 3 workers, idem, winkler 2, 27 mar 2000, *A. Alvarado*, IAvH; **Caquetá:** 2 workers, San José de la Fragua, vda. La Esmeralda, Yurucaco River, 1500 m, 7-10 sep 2000, *E.L. González*, IAvH; **Chocó:** 9 workers, Serranía de Baudó, Yupe trial, ex stomach *Dendrobates aureus*, 500-700 m, *P.A. Silverstone*, LACM; **Magdalena:** 7 workers, 38 km SE Minca, 11°08’N 74°06’W, 1050 m, 13 ago 1985, *J. Longino No. 747-S*, LACM. COSTA RICA. 1 worker, Alajuela, 14 km S Volcán Arenal, 1000 m, 29 abr 1988, *J. Longino No. 2037-5*, IAvH and INBio; 12 workers, Heredia, Monte Allegro, Santo Domingo de Heredia, 22 jun 1990, *I. Perfecto*, LACM; 10 workers, Puntarenas, Sirena, Stn 926, 28 oct 1981, *R.W. Matthews & C.K. Starr*, LACM; 3 workers, Reventazón, *Hamburg Farm*, MZSP; 2 workers San José, *H. Schmidt*, MZSP. MEXICO. **Veracruz:** 11 workers, NE Catemaco, litter, 4 m, 27 ago 1970, *E.M. & J.L. Fisher*, LACM. PANAMA. **Colón:** 2 workers, 1 soldier, Barro Colorado Island, Canal Zone, ene 1960, *W.L. Brown & E.S. McCluskey B-10*, MZSP; 1 worker, 1 soldier, idem, LACM; idem, 6 worker, Barro Colorado Island, 17 nov 1975, *C. Toft & S. Levings*, LACM. SURINAM. 2 workers, 1 soldier, Lelydor, Bernhardsdorp, “monsoon forest”, mar 1961, *E.O. Wilson*, LACM. PERU. **Madre de Dios:** 6 workers, Puerto Maldonado, 260 m, 13-16 jun 1981, *C. Kugler & R.R. Lambert*, LACM. TRINIDAD. 1 worker, 1 queen, 1 male, Cumaca, Oropouche Cave, 18 jun 1961, *E.O. Wilson*, MZSP.

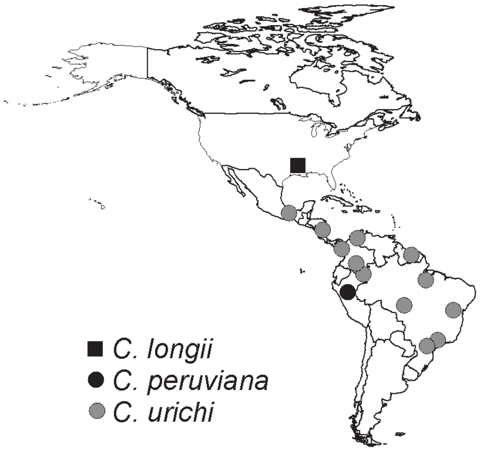

Figure 10. Distribution of *C. longii*, *C. peruviana* and *C. urichi*.

Comments. This species is widely distributed in the neotropics, from México to Argentina. As in other species of the complex, there is a marked contrast between the major worker (soldier) and the minor worker. Female dimensions are approximately the same as those of the soldiers. Borgmeier (1949) described and illustrated a case of “dinergatogyny” from a Costa Rican specimen of *O. morai*.

Three species close to *C. urichi* have been described. In *Erebomyrma nevermanni* Mann (1926) describe two critical traits as “Promesonotum sculptured ... with the striae irregularly longitudinal”, and “Hairs ... shorter [than those of thorax and abdomen] and semirecumbent on head and appendages”. These traits are not worthy of specific status regarding the variation in *urichi*. Later Menozzi (1931) described *Erebomyrma morai* from Costa Rica. He described promesonotum as rugose punctate with rugae “more bigger than those of head”, and erect pilosity in scape and legs “a little longer and erect than those of rest of body”. As in *E. nevermanni* this traits put this species in the *urichi* morphological spectrum. Andreas Taeger, from the Deutsches Entomologisches Institut, kindly studies a cotype worker of *Erebomyrma eidmanni* Menozzi and send me notes and pictures. The information provided convinces me about the synonymy of this name under *C. urichi*. I examined a female *O. eidmanni* corresponding to the type series from Mendes, Brazil, referred to by Menozzi (1936) and collected by Eidmann (MZSP). Despite slight difference in size, there is no important differences between this female and those I examined from Oropouche, Trinidad (MZSP). The soldier from BCI, Panamá (MZSP) studied by Wilson (1962) and tentatively classified as *E. nevermanni* differs a little in size from the *C. urichi* soldier, but otherwise there are no important differences. Figure 1 in Wilson (1962:64) shows a lateral view of the thorax of *O. nevermanni*(?) that differs in appearance from an *O. urichi* thorax. The drawing is not very true to the specimen though, and direct comparison of both soldiers reveals only minor differences between them.

In the case of the workers, there is a slight difference in size, but in morphology they are very alike. The sculpturing of the head tends to vary from feebly to strong impressions, and the area of head-sculpturing also varies. The sculpturing of the promesonotum is variable as well, from weakly-inscribed longitudinal lines to strong carinae. The propodeal teeth vary from subtriangular to more pointed and directed upward; as with the promesonotal sculpturing there are intermediate cases. The propleural projections can be pointed or blunt (in lateral view).

In summary, there are no clear, constant characteristics that permit separation of the species proposed by Mann (1926) and Menozzi (1931), and I consider them conspecific. Although I was not able to examine the *O. peruvianus* (Emery) type, and the original description is inadequate (Emery 1906), there is a characteristic that, at least for the present, suggests that *O. peruvianus* and *C. urichi* are not conspecific. Emery (Emery 1906) pointed out that the *peruvianus* petiole does not have the posterior concavity and carinae of *longii*, and since *longii* and all the analyzed *urichi*, *eidmanni* and *nevermanni* material show constancy in this character, it seems likely that the female described belongs to a different species. The true status of *peruvianus* can only be confirmed when someone is able to examine the type. The other described species within *Oligomyrmex*, and possibly near to *urichi*, is *O. bruchi*, described by Santschi (1933) on the basis of a female. Kusnezov (1951) described an ergatogyne and illustrated a worker. Nevertheless, both the description and the drawings show this to be a typical *Carebara* (now *C. cocinna* complex), with 9-segmented antennae and very small worker without propodeal spines.

Carebara brevipilosa sp. nov.

Worker measurements Holotype (Paratypes, n=4): HW 0.48 (0.42 – 0.48) HL 0.52 (0.48 – 0.52) SL 0.34 (0.31 – 0.34) PW 0.27 (0.24 – 0.27) WL 0.50 (0.49 – 0.50) GL 0.46 (0.46 – 0.50) TL 1.87 (1.87 – 1.88) CI (92) 88 - 92 SI 70 (70 – 74).

Worker diagnosis: Very similar to *C. urichi* but with the following differences.

Promesonotum and sides of pronotum usually reticulate, in a few workers feebly rugoreticulated, sometimes meshed with a central area smooth and shining. Sides of mesosoma and propodeum densely reticulated. Short curved hairs (less than 0.08 mm) over head, antennae, mandibles, promesonotum, a few in petiole and gaster; those of head slender and reclining. Hind tibiae with short, appressed hairs, none more than 50% of the maximum tibial width. Entire body yellowish ferruginous to dark brown.

Holotype worker. COLOMBIA. **Caquetá:** San José de la Fragua, La Esmeralda, Yuruyaco River, 1500 m, 7-10 sep 2002, *E.L. González leg.*, deposited in IAvH.

Paratypes. BRAZIL. **São Paulo:** 3 workers, Agudos, 23 feb 1995, *W. Kempf 1806*, CEPLAC and MZSP. COLOMBIA. 1 worker, same data as type, ICN; **Amazonas:** 3 workers, Amacayacu National Park, Mata-Mata creek, 3°48’S 70°15’W, Winkler 2, 27 mar 2000, *R. Alvarado, leg.*, IAvH and ICN; **Nariño:** 2 worker, Territorio Kofán, 00°30’N 77°13’W, 1430m, Winkler T4 in forest, 25 nov 1998, *E.L. González, leg.*, IAvH and MCZ.

Comments. As in the case of *urichi*, there is variation in color and sculpturing, as well as pilosity and the propodeal spine shape. While not always apparent locally, this is evident at greater geographical scales. Initially, I recognized a single species, *C. urichi* (see above), with the others (*nevermanni*, *morai*, and *eidmanni*) as junior synonyms. Nevertheless, Longino (pers. comm. and Ants of Costa Rica web page) has pointed out to me two characters which distinguish these ants as separate species. The first is the dorsal pronotal sculpturing, which is reticulate in the new species and rugo-reticulate with longitudinal rugulae in *urichi*. The second character is the length of the hairs of the hind tibia: long in *urichi* and short in *brevipilosa*.

The first of these characters generally works, although due to the variation typical in these species, the difference is not that striking. I admit that the material that I have been able to examine is limited, which necessarily limits my conclusions. Even so, *urichi* workers tend to have larger and coarser rugulae that are longitudinal and irregular, mixed with a reticulate background (sometimes smooth and shiny with weak reticulation). In new species the dorsum is mostly reticulate, with very short, almost nonexistent rugulae that sometimes surround a central smooth, shiny area. When there are long, longitudinal rugulae, these are not large and coarse (as in *urichi*) and do not stand up noticeably from the thorax tegument.

The second character suggested by Jack Longino works much better. In *urichi*, the workers have long hairs on the hind tibia; these are erect and their length at least 78-80% of maximum tibia width. In *brevipilosa*, these hairs are short, appresed, and are never greater than 50-60% of maximum tibia width.

***Carebara concinna* species complex**

Workers: Monomorphic and dimorphic. The minor workers very small; the major workers with massive heads (sometimes with ocellae and/or eyes) and more larger than workers. Dinergatogynes sometimes present. Antennae 9 segmented with club 2-segmented. Mandibles with 4 or 5 teeth. Eyes always absent in minor workers. Setation pattern in minor worker: Two to four standing hairs in the head, near to occipital margin, four in the anterior margin of pronotum, two to four in the propodeum (*C. anophthalma* secundarily naked). Metanotal groove developed. Propodeum unarmed. Propodeal spiracle large and round. Propodeal lobes small, continued up as lamelated carinae.

Queens: Strongly larger than workers. Antennae 10 segmented, the apical segments thicker than basal segments. Palps 3,2. Basal segment of the maxillary palp elongated laterally. Mandibles with 4-6 teeth. Propodeum rounded. Postpetiole very broadly attached to the gaster. Marginal cell closed.

Males: Scape short, shorter than each flagelomere. Clypeal median area semiglobular. Notauli absent, parapsidial furrows distinct. Genitalia “prominently exserted; parameres massive, semicircular in section, subtriangular in side view, curving in to meet on the midline; tenth tergite and ninth sternite produced to cover the bases of the parameres; digit long, narrow, flattened; aedeagus small, not serrate ventrally” (Ettershank 1966).

As pointed out previously, this is probable an artificial grouping, created for convenience in treating the American species with 9-segmented antennae and whose minor workers are eyeless. Analysis of Old World species might better define the limits of this complex. The majority of the species known for it are characterized by large females in contrast with very small workers (Wilson 1971). Nevertheless, Wheeler (1925) drew attention to the existence of both major workers and tiny, eyeless minor workers in *C. panamensis*. Kusnezov (1951) also pointed out the association of major workers (although in this case dinergatogyne) with tiny workers. I describe 2 species that are more dimorphic (although minor workers of *C. tenua* have not been found) and there is still a possibility that several of the species normally placed in *Carebara*, on the basis of just the minor workers, might also have major workers that are either rarely collected or not associated with the minor workers.

As in other myrmicine ants, tiny size is associated with morphological monotony; consequently, accurate separation of *Carebara* minor workers is challenging and requires careful scrutiny of fine characters at more than 80 magnifications. Future discovery of nests and complete samples of all phases may result in changes in the number of recognized species, which may well be lower than that proposed here. Unfortunately many *Carebara* minor workers collected alone cannot be identified with certainty.

Note: In the initial versions of this manuscript I proposed keys to separate the species known as the *Carebara lignata* complex. The recent arrival of new material has shown, though, that there are still more species to describe, or that some of those already described are more variable than at first apparent. I have thus decided to postpone a key until I have been able to examine more material (especially from Central America) and resolve species limits. Although the minute ants of this group are highly homogeneous, a good sample size might allow better definition of some species. Arrangement patterns of erect hairs, the metanotal groove, the metapleural sculpture, and the shape and size of the postpetiole are traits that may help define species. The user can meanwhile read the diagnoses and comments for each species in attempting to identify samples on hand.

Carebara anophthalma Emery
(Figs. 5F, G, 14)

Oligomyrmex anophthalmus Emery, 1906:138 (footnote) (w).
Carebara anophthalma: Wheeler, 1922a:170; Emery, 1922:221; Bolton, 1995:133.
Carebara winifredae Wheeler, 1922c:2 (w, q, m); Wheeler & Wheeler, 1954:142 (l); Bolton, 1995:134. syn. nov.

Worker measurements (n=5): HW 0.31 – 0.44 HL 0.39 – 0.50 SL 0.21 – 0.30 PW 0.20 – 0.31 WL 0.38 – 0.55 GL 0.38 - 055 TL 1.38 – 1.99 CI 79 - 90 SI 64 – 68.

Head slightly longer than wider. Posterior border concave, lateral sides faintly concave, narrowing anteriorly. Mandibles with 4 teeth, the apical larger. Median anterior clypeal border straight. Lateral clypeal carinae narrowing into antennal lobes, which are round. Scapes fail to reach the vertexal border in 1/4 of the head length. In side view, alitrunk flat, very feebly interrumped by the metanotal groove, impressed dorsal and laterally. Promesonotal suture impressed laterally. Short propodeal dorsum rounded in the declivity face. Propodeal spiracle circular, near the median distance and near to bullae of the metapleural gland. Bulla of metapleural gland small. Propodeal lobes reduced to very fine and narrow lamellae that reach more or less the mid distance of the declivity face of propodeum. Petiole peduncle differentiated from the node, anterior and dorsal sides of node convex in side view, posterior side slightly concave. Petiolar spiracle at anterior margin of node. Subpetiolar process reduced to a tiny blunt tooth. Postpetiole dorsally concave, lower than petiole. Body compact, smooth. Reclinated short pilosity (hairs less than 0.05 mm) over body. Median to larger hairs (more than 0.05 in length) absent. Four short hairs arising from the anterior clypeal margin. Body light yellow.

Material examined: BRAZIL. **Goias:** 2 workers, Jatal, UFG-Br. 364, km 192, 17 feb 1999, *J.L.M. Diniz*, MZSP; idem, 1 worker, Niquelândia, 14°01’S 48°18’W, Cerrado, 24 sep-6 oct 1995, *R. Silvestre, J.L.M. Dietz & C.R.F. Brandão,* MZSP; ECUADOR. 5 workers, Lita, 14 oct 1994, *J.P. Caldwell No. 10343*, CEPLAC and ICN; PERU. **Loreto:** 2 workers, 15 km WSW Yurimaguas, 5°59’S 76°13’W, 220 m, 22 mar 1986, *P.S. Ward No. 8701-28,* ICN.

Comments. This species is easily distinguished from any other of the complex. The body is compact, devoid of median to longer hairs and the head is narrower anteriorly. The clypeal and petiolar configuration are also distinctive. Although I have not been able to examine the holotype of this species, I think that the specimens described above match up well with the concept of *C. anophthalma*, which is still based on the meager original description. Wheeler (1922c) translated Emery’s description into English, from which I have extracted these critical traits: "[Body] uniformly yellow ... short pubescence apparently adherent, and there are not erect hairs, probably due to the defective preservation of the specimen ... head broader behind, feebly concave at the posterior border. Thorax feebly impressed between mesonotum and [propodeum] ... Length 1.6 mm". This species is the only American typical *Carebara* s.str. with this combination of traits. The head in full face view is reminiscent of the typical heads of the *Carebara escherichi* species-group (=*Paedalgus*) workers.

Wheeler (1922c) provided a description of worker, female and male of their *C. winifredae*, and illustrated the worker, described from ants collected in the nest of *Syntermes dirus* Klug in Guyana. The types are not available for study; however I can see workers from Ecuador (CEPLAC) with the label "*C. winifredae*, compared with type". I assume that this comparison is right; also Wheeler (1922c) suggested that *C. winifredae* might be a synonym of *C. anophthalma*.

Carebara bicarinata Santschi

Carebara bicarinata Santschi, 1912:139 (q, m); Wheeler, 1922c:1.

Besides from the original description, Wheeler (1922c) provided some notes of the female and male of this species, recorded from French Guiana and Brazil. He pointed out that "the males were found to be variable and Santschi was not sure that they belonged to the same species as the female". This recurring problem has arisen from the tendency of earlier myrmecologists to describe any sexual form alone, without reference to the associated workers. The result has been species names based on only females, males or both; these will continue to confound the species lists until nest series taken in the field make it possible to match up definitively the sexual forms with their respective workers.

***Carebara elongata* sp. nov.**

(Figs. 4H-I, 13)

Worker measurements Type: HW 0.21 HL 0.33 SL 0.15 PW 0.15 WL 0.30 GL 0.35 TL 1.15 CI 64 SI 71.

Diagnosis. Head notably longer than wider. Posterior border concave, lateral sides more or less straight, parallel. Mandibles with 4 teeth, the basal at some distance from the remainder. Median portion of clypeus slightly concave. Frontal lobes in full face view sinuous. Scapes short, fail to reach the vertexal border in 1/2 of the head length. Boy elongated. In side view, promesonotum flat. Metanotal groove shallow. Propodeum slighlt concave curving into declivity side. Propodeal spiracle relatively small, circular, high and near the propodeal margin. Bulla of metapleural gland small. Propodeal lobes reduced to narrow lamellae that reach more or less the propodeal spiracle. Petiole with short peduncle, evenly continuous with the dorsal rounded node; petiolar node midway along petiolar length. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole subsphaerical, postpetiole broader than longer and broader than petiole. In dorsal view, anterior margin of first tergum concave. Body smooth and shining. Mandibles with several scattered punctures, head with dense piligerous punctures in the sides, more or less 10-11 punctum each longitudinal row. Sides of alitrunk with feebly longitudinal striation. Sides of petiole with feebly reticulation. Short down-curved hairs (about 0.02 mm) over head, antennae, mandibles, promesonotum, petiole, postpetiole, gaster and legs. Hairs moderate (about 0.03 mm) as follow: Four in promesonotum, four in propodeum, two in petiole, four in postpetiole, several on gaster, two in frontal lobes, several on mandibles.

Long hairs (more than 0.04 mm): Four in the clypeus proyected forward over most of mandibles length, two on head, near the occipital border. Yellowish brown.

Holotype worker. COLOMBIA. **Magdalena**: Tayrona National Park, Zaíno section, 11°12'01"N 74°02'01"W, 50 m, in Malaise trap, 30 ago-20 sep 2000, *R. Henríquez leg. M 624*, deposited in IAvH.

Paratypes. 3 workers, same data as type, deposited in ICN, MZSP and USNM.

Comments. This is the most elongated species of the complex. The head is notably longer than wide. The scapes are very short and the frontal lobes and clypeus are also distinctive. This worker is reminiscent of *Carebara* workers associated with "major" workers (see *C. intermedia*). It is possible that still-uncollected majors exist.

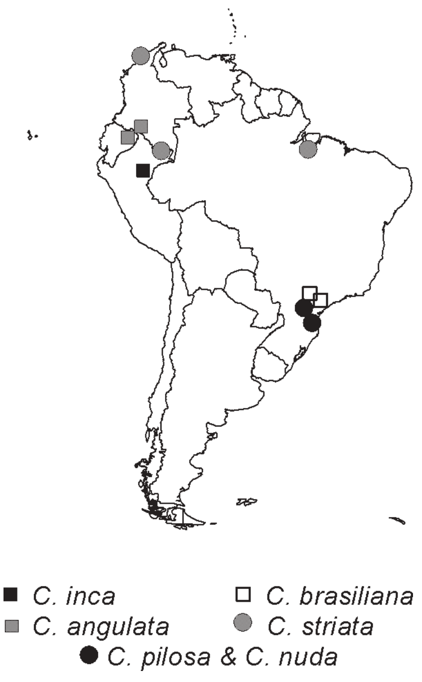

Figure 11. Distribution of *Carebara* species.

Carebara globularia sp. nov.

(Figs. 4F-G, 13)

Worker measurements Holotype (Paratypes n=3): HW 0.24 (0.24 – 0.25) HL 0.31 (0.31 – 0.33) SL 0.16 (0.16 – 0.18) PW 0.14 (0.14 – 0.15)WL 0.29 (0.29 – 0.30) GL 0.24 (0.24 – 0.25) TL 1.04 (1.04 – 1.07) CI 77 (77) SI 67 (67 – 72).

Diagnosis. Head slightly longer than wide. Posterior border concave, lateral sides faintly concave. Mandibles with 4 teeth (right mandible with basal tooth effaced). Median portion of clypeus slightly concave. In frontal oblique view, clypeal lateral carinae strongly-narrowed posteriorly and between frontal lobes, then continued as frontal triangle. Scapes fail to reach the vertexal border in 1/2 of the head length. In side view, alitrunk slightly convex, interrupted by the deep metanotal groove. Mesonotal groove deep and well-marked dorsally and partially laterally. Propodeum with feeble angulation between dorsal and sloping faces. Propodeal spiracle relatively large, circular, high and very close to the propodeal margin. Bullaeof metapleural gland moderate in size. Propodeal lobes reduced to narrow lamellae that reach the more propodeal dorsum. Petiole with short peduncle, evenly continuous with the dorsal rounded node; petiolar node at midway of petiolar length. Subpetiolar process produced as strong spine directed forward, spine normally not visible in mounted specimens. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole longer than wide, postpetiole subglobose, wider posteriorly and notably wider and longer than petiole. In dorsal view anterior margin of first slightly concave. Body smooth and shining. Mandibles with several scattered punctures, head densely puncturated (except in the central longitudinal area), each punctum with a small hair. Anterior sides of head with very fine longitudinal striation. Sides of alitrunk (except pronotum), petiole, postpetiole and dorsum of petiolar peduncle with a faint to moderate reticulation (Clearly seen in fresh specimens, barely seen in some dry mounted specimens). Short curved hairs (less than 0.017 mm) abundant over body, especially on dorsum of head. Medium hairs (about 0.033 mm): Six to eight in promesonotum, two on propodeum, about four in petiole and four in postpetiole, several on gaster. Longer hairs (more than 0040 mm): Four arising from anterior clypeal margin extending forward over most of mandible length. Two in each side of head, near the occipital border. Yellow brown.

Holotype worker. COLOMBIA. **Caquetá:** Solano, Chiribiquete National Park, Mesay River, "Green Blue Forest", site 5, 0°14'32"N 72°56'15"W, 300 m, winkler No. 66, 8 feb 2000, *F. Quevedo, leg.*, deposited in IAvH.

Paratypes. 3 workers, same data as type, IAvH; COLOMBIA. **Amazonas**: 1 worker, 7 km NW Leticia, in litter, 20-25 mar 1972, *S. & J. Peck No. 250*, MZSP; **Nariño**: 1 worker, Kofan Territory, 700 m, 28 sep 1998, winkler No. 2, *E.L. González*, MCZ. ECUADOR. **Napo:** 2 workers, Limoncocha, 00°24'N 76°36'W, 280 m, 13 ago 1973, *M. Retttenmeyer No. 67*, IAvH and MZSP.

Queen and male: Unknown.

Comments. This is one of the smaller species of the complex and, hence of ants in general, with a total length barely more than a millimiter. The general habitus is similar to *C. reticulata* of the Andean mountains. However, the clypeal and propodeal configuration, the propodeal spiracle and, especially, the postpetiole size and shape are distinctive. The presence of a smooth and shining frontal triangle and the subglobose postpetiole differentiate this species from any other in the complex.

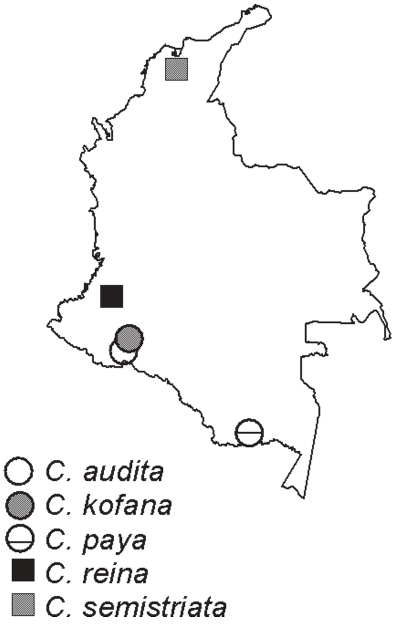

Figure 12. Distribution of *Carebara* species.

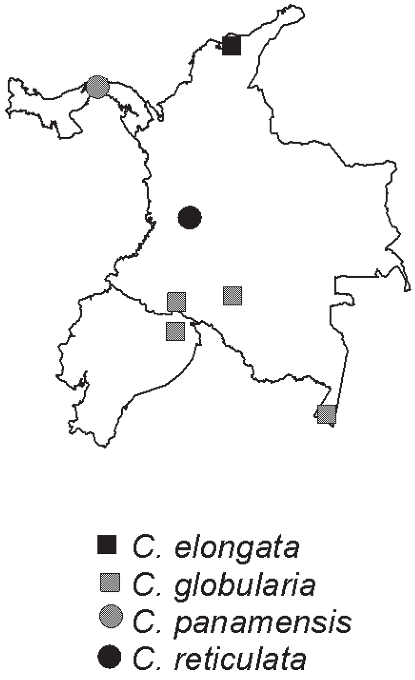

Figure 13. Distribution of *Carebara* species.

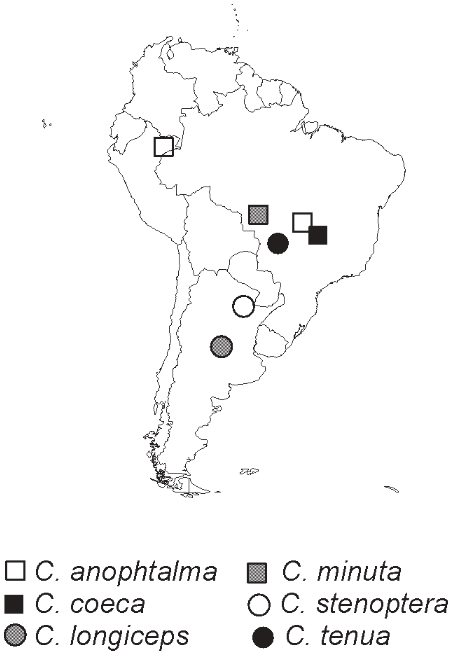

Figure 14. Distribution of *Carebara* species.

Carebara incierta n.n.

Carebara incerta Santschi, 1923:66 (m).

This name is proposed for *Carebara incerta* Santschi, 1923, name preoccupied by *Carebara* (=*Oligomyrmex*) *incerta* Santschi, 1919, **new combination** proposed in the **Appendix** for the African species. *C. incierta* is based on solitary male collected in Brazil. As implied by the name, the real status of this taxon is uncertain, due to absence of workers associated.

Carebara longiceps (Santschi) comb. nov.

(Figs. 4A-E, 14)

Oligomyrmex longiceps Santschi, 1929:295 (w, m); Bolton, 1995:299.
Erebomyrma longiceps: Brandão, 1991:343.

Worker measurements Lectotype: HW 0.25 HL 0.38 SL 0.18 PW 0.15 WL 0.31 GL 0.33 TL 1.18 CI 66 SI 72.

Head slightly longer than wide. Posterior border concave, lateral sides faintly concave. Mandibles apparently with 4 teeth (lectotype with mandibles closed, difficult to see clearly). Median portion of clypeus slightly concave. Scapes fail to reach the vertexal border in 1/3 of the head length. Frontal lobes rounded. In side view, alitrunk flat, slightly interrupted by the shallow metanotal groove. Sides dorsal and posterior of propodeum nearly at 90°. Propodeal spiracle relatively small, circular, high and near the propodeal margin. Bullae of metapleural gland large. Propodeal lobes reduced to narrow lamellae that more or less reach the propodeal spiracle. Petiole with short peduncle, evenly continous with the dorsal rounded node; petiolar spiracle nearer to propodeal lobes. Subpetiolar process produced as small spine directed anteriorly. Postpetiole dorsally concave, lower than petiole. Anterior margin of first tergum slightly concave in dorsal view. Body smooth and shining. Vestiture as in *C. elongata* except by: two moderate hairs near each occipital corner, several in anterior portion of pronotum. Body light yellow.

Material examined: Lectotype worker (here designated): ARGENTINA. Alta Gracia, 1 worker, la Granja, Sierras de Córdoba, 1924, *C. Bruch leg.*, MZSP.

Male measurements: HW (including eyes) 0.75 HL 0.50 EL 0.13 SL 0.10 PW 0.69 WL 1.10 GL 1.38 TL 3.58 CI 150 SI 13.

Mandibles with the masticatory margin more or less straight, with four teeth nearly similar in size. Clypeus markedly bulging, anterior margin feebly concave. Scapes very short. Promesonotum dorsally with three longitudinal lines, the central longer. Marginal cell closed. Petiole ventrally with several irregular longitudinal carinae. Postpetiole broadly attached to the gaster. Genitalia with two big falcate parameres. Body slightly shining with moderate pilosity, especially on head. Head anteriorly with strong longitudinal striation, posteriorly oblique striation. Longitudinal striation in the central area of pronotal dorsum. Body dark brown, appendages lighter.

Material examined: 1 male, paralectotype (here designated). Same data as worker (MZSP).

Queen: Unknown.

The worker lectotype and male paralectotype designated here have the following labels: ARGENTINA. Alta Gracia, La Granja, Sierras de Córdoba, 1924, C. Bruch leg. / Typus / 1683 / *Oligomyrmex longiceps* / *O. longiceps* det. Borgmeier. This species can be readily differentiated by the frontal lobe configuration, the propodeal configuration in side view, and the small subpetiolar spine. Moreover, the bullae of metapleural gland look bigger than in other species. Knowledge of males in this group is limited, but the head striation is remarkable. This species appears to have the most southerly distribution of the complex.

Carebara mayri (Forel)

Tranopelta mayri Forel, 1901:61 (m)
Carebara mayri: Santschi, 1928:197; Bolton, 1995:133.

Based on one male collected in Brazil, and described by Forel in the genus *Tranopelta*. The type of this species is not available for study and knowledge of males in *Tranopelta* and Pheidologetoni is limited. However, there are apparently some traits that can separate these genera. In *Carebara* the clypeus is globose and markedly protruding, the mandibles have four teeth similar in size, the scapes are very short and the ocellae are more “turreted” (in *Tranopelta* males: Clypeus normal, mandibles with 3 teeth, the apical larger and separated from the short basal teeth, scape longer, ocellae not disposed in turret projection).

***Carebara minuta* sp. nov.**
(Fig. 14)

Worker measurements Holotype (Paratype): HW 0.23 (0.21) HL 0.30 (0.31) SL 0.16 (0.15) PW 0.15 (0.15)WL 0.27 (0.28) GL 0.25 (0.24) TL 0.99 (1.00) CI 75 (70) SI 69 (71).

Diagnosis. Head slightly longer than wide. Posterior border concave, lateral sides faintly concave. Mandibles with 4 teeth. Median portion of clypeus slightly concave. In frontal oblique view, clypeal lateral carinae strongly narrowed posteriorly and between frontal lobes, then continued as frontal triangle. Scapes fail to reach the vertexal border in 1/2 of the head length. In side view, alitrunk slightly convex, interrupted by the deep metanotal groove. Propodeum with feeble angulation between dorsal and sloping faces. Propodeal spiracle relatively large, circular, high and very close to the propodeal margin. Bullae of metapleural gland relatively large in size. Propodeal lobes reduced to narrow lamellae that reach the propodeal dorsum. Petiole with short peduncle, evenly continuous with the dorsal rounded node; petiolar node midway along petiolar length. Subpetiolar process produced as strong spine directed forward, spine normally not visible in mounted specimens. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole longer than wide, postpetiole subglobose, wider posteriorly and notably wider and longer than petiole. In dorsal view anterior margin of first tergum slightly concave. Body smooth and shining. Mandibles with several scattered punctures, head with scattered puncturations (except in the central longitudinal area), each punctum with a small hair. Anterior sides of head with very fine longitudinal striation. Sides of alitrunk (except pronotum), petiole, postpetiole and dorsum of petiolar peduncle with a faint to moderate reticulation. Short curved hairs (less than 0.017 mm) relatively abundant over body, especially on dorsum of head. Medium hairs (about 0.033 mm): Six to eight on promesonotum, two on propodeum, about four on petiole and four on postpetiole, several on gaster. Longer hairs (more than 0.040 mm): Four arising from anterior clypeal margin extending forward over most of mandible length. Two in each side of head, near the occipital border. Yellowish brown.

Holotype worker. BRAZIL. **Mato Grosso:** Utiariti, Rio Papagaio, 10 nov 1966, *K. Lenko & Pereira No. 4489*, deposited in MZSP.

Paratype, same data as type, MZSP.

Comments. This species, with body length from 0.99 to 1.00 mm, may be the smallest in the Western Hemisphere. It is very close to *C. globularia* with which it shares postpetiolar and clypeal configuration and frontal triangle. *C. minuta* is smaller, the clypeal apron shorter and the head pilosity less dense. The specimens have the label "*C. mayri*", but I can't find any positive proof that both workers belong to this species, otherwise known only from males. Two males labeled as "*C. mayri*" in MZSP (and a few others without names) came from other sites in Brazil, but there is no local association between these workers and *C. mayri* males. As a result, *C. minuta* may actually be workers of *mayri*, or workers from any other Neotropical *Carebara* described solely on the basis of females or males. Only the collection of nest series with all castes will clarify the picture.

***Carebara reticulata* sp. nov.**

(Figs. 5A-E, 9, 13)

Worker measurements Type (Paratypes n=3): HW 0.29 (0.27 – 0.29) HL 0.36 (0.35 – 0.36) SL 0.19 (0.18 – 0.19) PW 0.19 (0.18 – 0.19) WL 0.36 (0.34 – 0.36) GL 0.33 (0.33) TL 1.28 (1.24 – 1.28) CI 81 (79 - 81) SI 66 (66 - 68).

Diagnosis. Head slightly longer than wide. Posterior border slightly concave, lateral sides faintly concave. Mandibles with 4 teeth (basal one reduced). Median portion of clypeus straight to slightly concave. Scapes fail to reach the vertexal border in 1/3 of the head length. In side view, alitrunk slightly convex, interrupted by the deep metanotal groove. Promesonotal suture impressed laterally. Mesonotal groove deep and well-marked dorsally and laterally. Propodeum with feeble angulation between dorsal and sloping faces. Propodeal spiracle relatively small, circular, high and near the propodeal margin. Bullae of metapleural gland small. Propodeal lobes reduced to narrow lamellae that more or less reach the propodeal spiracle. Petiole with short peduncle, evenly continuous with the dorsal rounded node; petiolar node midway along petiolar length. Subpetiolar process produced as strong spine directed forward, spine normally not visible in mounted specimens. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole subspherical, postpetiole broader than long and broader than petiole. In dorsal view anterior margin of first tergum straight. Body smooth and shining. Mandibles with several scattered punctures, head densely puncturated (except in the central longitudinal area), each punctum with a small hair. Anterior half of head with very fine longitudinal striation. Sides of alitrunk (except pronotum), petiole, postpetiole and dorsum of petiolar peduncle densely reticulated, sometimes the sculpturing poorly defined. Short curved hairs (less than 0.05 mm) over head, antennae, mandibles, legs, promesonotum, as well as a few in petiole. Longer hairs (more than 0.05 in length): Four arising from the anterior clypeal margin projected forward near the mandibular apices; two near the pronotal humeri, two in the promesonotal dorsum, near the posterior margin; two in the propodeal dorsum, two in petiole, two in postpetiole, several on first tergum. Reddish brown.

Holotype worker. COLOMBIA. **Quindío:** Filandia, Barbas River, 4°42’59”N 75°38’59”W, forest, 1655 m, winkler trap, 5 feb 2000, *J. Sossa, leg*., deposited in IAvH.

Paratypes. 1 worker, same data as type; COLOMBIA. **Quindío:** 2 workers, Génova, vda. El Dorado, Fca. San Isidro, 4°12’N 75°47’W, 1500 m, winkler, 31 oct 1999, *J. Sossa leg*.; 1 worker, idem, vda. El Cedral, Fca. Buenos Aires, 4°14’06”N 75°46’32”W, 1600 m, winkler trap in café plantation mixed with “shadow treees”, 28 sep 1999, *E.L. González leg.;* 2 workers, Calarcá, vda. Santo Domingo, Fca. Santa Librada, 4°31’55N 75°37’61W, 1500 m, winkler trap, *J. Sossa, leg.;* 2 workers, Quimbaya, vda. El Laurel, Fca. Balmoral, 4°35’15”N 75°47’39”W, 1200 m, winkler trap, 4 nov 1999, *J. Sossa, leg.;* 1 worker, Córdoba, vda. San Diego, Fca. San Diego, 4°24’12”N 75°41’24”w, 1350 m, winkler in *guadual*, 3 feb 2000, *J. Sossa leg.* Paratypes deposited in BMNH, IAvH, LACM, MCZ, MIZA, MZSP and USNM.

Comments. This species can be separated easily from other known species of the complex by the dense reticulation on the sides of the thorax (Fig. 9), which extends to the sides of the petiole, postpetiole, and dorsum of the petiolar peduncle. The ventral spine of the petiole is strong, directed forwards, and visible in specimens with the petiole raised. The species is represented principally by Winkler trap captures from soil and leaf litter of coffee agroecosystems in the mountains of the Central Cordillera of Colombia, between 1200 and 1600 m above sea level.

Carebara bruchi **(Santschi) comb. nov.**

Oligomyrmex bruchi Santschi, 1933:116 (q); Bolton, 1995:299.
Erebomyrma bruchi (Santschi): Brandão, 1991:343.

The description of this species is based on a female collected in Argentina (Santschi, 1933). Kusnezov (1951) described a “dinergatogyny”, and illustrated part of the female, dinergatogyne, and worker. The description is poor, though, and does not permit an adequate evaluation of the limits of this species with its neighbors (see below).

Carebara stenoptera **(Kusnezov) comb. nov.**

(Figs. 7C-D, 14)

Oligomyrmex stenopterus Kusnezov, 1952:184 (q): Bolton, 1995:300.
Erebomyrma stenoptera (Kusnezov): Brandão, 1991:343.

Worker, major worker(?), male: Unknown.

Queen measurements (n=1): HW 0.75 HL 0.94 SL 0.46 EL 0.19 WL 1.36 GL 1.88 TL 4.9 CI 80 SI 61.

Material examined: ARGENTINA. 2 females, *Bemberg NK 716*, MZSP; 1 female, Misiones, Loreto, *A.A. Oglobin leg.* “in nuptial flight”, ICN.

Described by Kuznezov (1952) on the basis of females collected in Argentina. The head is slightly narrower posteriorly and the wings are narrower than in other species in the complex. Neither males nor workers are known.

Carebara coeca **sp. nov.**

(Figs. 6A-C, 14)

Major worker (n=1) Holotype: HW 0.55 HL 0.78 SL 0.28 PW 0.33 WL 0.65 GL 0.75 TL 2.61 CI 71 SI 51.

Diagnosis. Head rectangular, posterior border deeply semi circularly excised, sides straight, parallel. Mandible stout, masticatory border straight, forming an angle about 90° with basal border. Masticatory border with 5 stout teeth. Clypeus narrow, medial portion slightly concave. Frontal triangle well-defined. Frontal lobes somewhat continued posteriorly as short longitudinal rugulae. Scapes very short. Ocellae and eyes present, reduced or absent (see coments). In side view mesosoma flat, metanotum slightly higher, propodeum lower. Pronotal suture feebly impressed dorsally. Metanotum narrow. Dorsal face of propodeum sloping and then curving into the sloping face, without spines or angulations. Propodeal spiracle rounded, varying in closeness with metapleural gland bullae. Petiole with short peduncle, lateral swellings and strong thick lamellar median subpetiolar process. Postpetiole in posterior view campanuliform, ventrally with anterior carinae. Body smooth, somewhat shining. Head with a longitudinal rugulation. Anterior half of pronotum reticulated, otherwise pronotum and mesonotum with feeble longitudinal rugulation, some times with areas smooth and shining. Metapleura, propodeum petiole and postpetiole with fine reticulation. Pubescence very sparse over head, otherwise absent. Large hairs (about 0.13 mm) occur densely on head, several on promesonotum, petiole, postpetiole and gaster. Body light brown.

Minor worker Paratype: HW 0.23 HL 0.31 SL 0.16 PW 0.14 WL 0.28 GL 0.31 TL 1.10 CI 74 SI 70.

Head longer than wide. Posterior border concave, lateral sides faintly concave. Mandibles with 4 teeth. Median portion of clypeus nearly flat. In frontal oblique view, clypeal lateral carinae strongly narrowed posteriorly and between frontal lobes, then continued as frontal triangle. Scapes fail to reach the vertexal border in 1/2 of the head length. In side view, alitrunk slightly convex, interrupted by the deep metanotal groove. Dorsal face of propodeum curving in sloping face. Propodeal spiracle relatively large, circular, high and very close to the propodeal margin. Propodeal lobes reduced to narrow lamellae that reach the propodeal dorsum. Petiole with short peduncle, evenly continuous with the dorsal rounded node; petiolar node at midway of petiolar length. Subpetiolar process produced as anterior spine directed forward, spine normally not visible in mounted specimens. Postpetiole dorsally concave, lower than petiole. In dorsal view petiole longer than wide, postpetiole globose more or less as long as wide. In dorsal view anterior margin of first tergum straight. Body smooth and shining. Mandibles with several scattered punctures, head with scattered puncturations (except in the central longitudinal area), each punctum with a small hair. Anterior sides of head with very fine longitudinal striation. Sides of alitrunk (except pronotum), petiole, postpetiole and dorsum of petiolar peduncle with a faint to moderate reticulation. Short curved hairs (less than 0.03 mm) relatively abundant over body, especially on dorsum of head. Medium hairs (about 0.04 mm or longer): Four in the clypeus projecting forward, four on promesonotum (two anteriorly, two posteriorly), two on petiole, four on postpetiole. Apparently two on each side of head, near the occipital border. Whitish yellow.

Queen measurements: HW 0.48 HL 0.60 SL 0.36 EL 0.14 WL 0.78 GL 0.85 TL 2.73 CI 80 SI 75.

Head longer than wide, the posterior margin concave, the sides more or less parallel, lightly narrowed posteriorly. Stout mandibles with five coarse teeth. Medial part of the clypeus concave and with two carinae that project anteriorly as angles which turn backwards and unite posteriorly at the level of the anterior margins of the antennal receptacles. Large, deep area surrounding tentorial pits, adjacent to the antennal sockets. Short scapes end at about the middle of the head. Large, multifaceted eyes. Three ocellae form a triangle, the posterior ones some way from vertex margin. Propodeal spiracle relatively large, circular, almost touching the bulla of the metapleural gland. In dorsal view, the petiole has a strongly-narrowed peduncle, and the node is wider than long. Petiole ventrally with an anterior spine, directed anteriorly. Dorsum of the head with longitudinal striations that disappear before the vertex, where there are a few disperse pits. Much of the mesosoma smooth and shining, except for the posterior medial part of the promesonotum, which has a few longitudinal rugulae. Short, appressed hairs on the head, mesosoma (except propodeum), petiole and post-petiole. Long, erect hairs over entire body, except the propodeum, where there are two. General color is light brown, except mandibular teeth, eyes and antennal club, which are darker.

Male measurements: HW 0.64 HL 0.55 SL 0.11 EL 0.34 WL 1.19 GL 1.00 TL 3.24 CI 116 SI 17

Head slightly wider than long. Mandibules with two teeth, the larger of which is apical, barely touching at the tips. Palps, 2,2 *in situ*. Eyes big, globular, with inferior parts bulging beyond the level of the clypeus. Anterior margin of clypeus more or less straight. Medial clypeus swollen. Very short scapes, the second antennal segment globose, the rest filiform. Three large ocellae form a cusp with the superior parts supassing above the level of the vertex. In the promesonotum there is a weak, complete, medial longitudinal line, two lateral, diagonal anterior lines, and two lateral, straight posterior lines. Wings with dense micropilosity, open marginal cell. Long petiole, with a long peduncle and a moderate node in the posterior part. Post-petiole about as long as wide, the anterior part narrowed. Large, erect hairs on the head, parts of the promesonotum, propodeum, and gaster; shorter over the rest of the body. Body light brown, head dark brown, eyes black.

Holotype major worker. BRAZIL. **Goias:** Jatai, UFG, CCA, BR 364, km 192, in nest, 10 ene 2000, *J. Diniz & C. Lásaro*, deposited in MZSP.

Paratypes. 1 major worker, 2 minor workers, same data, MZSP. BRAZIL. **Bahia:** 2 queens, 1 mayor, 1 male, 1 worker, Barrolandia, 16-23 jul 1994, *S. Lacau, leg.*, CEPLAC.

Additional non type material observed: BRAZIL. **Bahia**: 2 queens, 2 soldiers, Itacaré, 21 dic 1993, *Jardim J.*, CEPLAC and ICN; idem, 1 soldier, Mascote, 15°44’04S 39°23’04”W, 11 nov 1999, *J.R.M. dos Santos, leg.*, CEPLAC; **Goias:** 1 soldier, 3 workers, Jatai, UFG, CCA, BR 364, km 192, in nest, 10 ene 2000, *J. Diniz & C. Lásaro et al.*, CEPLAC; COLOMBIA. **Caquetá:** 1 soldier, 1 worker, PNN Chiribiquete, Mesay River, Site 5, W64, 8 feb 2000, *F. Quevedo, leg.*, IAvH; **Putumayo**: 2 soldiers, Villa Garzón, 27 jul 1977, *D. Jackson, leg.*, ICN.

Comments. This species is interesting (as *C. tenua*), as it represents a direct association of the minuscule workers that are morphologically indistinguishable from typical *Carebara* and major workers (soldiers) whose morphology corresponds to typical *Oligomyrmex*. The type samples come from a single nest. The soldier is very similar to the *C. tenua* soldier described further on, but is smaller in size; neither eyes nor ocellae can be detected at 100X magnification; the mesosomal configuration differs somewhat (dorsal face of the propodeum sloping); and the petiole has a thick longitudinal keel ventrally. The minor worker is difficult to separate from other workers of the *Carebara concinna* complex. The propodeal spiracle is slightly bigger and is above, near the propodeal margin. Other aspects of this species and its neighbors are discussed in the section describing *C. tenua*.

Variation. There is a series of samples showing variation in several characteristics, but which I prefer to leave as C. *coeca*, at least for now. In general, there is variability in the ocellae and eyes, from totally eyeless (from which the species' name derives) to samples with medial ocella present and eyes. Both ocellae and eyes exhibit a variable degree of development, from scars and dark spots to well-defined ocellae and eyes with several ommatidia.

This variablity is demonstrated by these cases: In a sample from Putumayo, Colombia [HW 0.51 HL 0.75 CI 68], one of the major workers has an eye reduced to one ommatidium on the left side of the head, but on the other side nothing more than a scar is visible. In a second major worker, there are no detectable eyes (at least at 120X), only some weak scars. In the first worker, ocellae are not visible, and in the second there is an ovoid pit in the normal position of the anterior ocellus, without a trace of the others. In a sample from Caquetá, Colombia [HW 0.48 HL 0.63 CI 76] there are neither ocellae nor eyes; in major workers from Ilheus, Brazil [HW 0.50 HL 0.66 CI 76] there is a medial transparent ocellus and dark lateral eyes; in major workers from Itacaré, Brazil [HW 0.51 HL 0.68 CI 75], the medial ocellus is present and dark and the eyes are present, but colorless; in a different sample from Goias, Brazil [HW 0.52 HL 0.75 CI 69] there are no eyes and the medial ocellus is reduced to a scar; in still another sample from Barrolandia, Brazil [HW 0.50 HL 0.68 CI 73] there is no medial ocellus and the eyes are reduced to dark spots; and, lastly, a major worker collected in Bahia, Brazil [HW 0.51 HL 0.71 CI 72] has a medial ocellus but no eyes.

In addition to this variability in ocellae and eyes, there is variation in the distance between the propodeal spiracle and the anterior border of the metapleural gland bulla. At one extreme, these structures touch one another, while at the other the spiracle is separated by a distance equivalent to half its diameter. The thorax sculpture is variable, from obvious to dilute and mixed with smooth, shining areas, but there is always some kind of longitudinal striation in the greater part of the pronotum and mesonotum.

The sample from Barrolandia, Bahia, Brazil (CEPLAC) is especially interesting since it contains all possible forms: queen, male, major worker, and minor worker. This last is partly stuck in the glue and it is impossible to observe its head. Taking into account the above observations of variability, I place these ants in this species, although the minor worker appears to differ in some small details from other minor workers associated with other samples. In this Barrolandia sample, the male is larger than the female, which is unusual in ants. The only major worker in the sample does not have ocellae and the eyes are reduced to dark spots, apparently without functional ommatidia.

Is *Carebara coeca* a single species, with variation in the presence and development of the medial ocellus, eyes, and grade of sculpturing? Or is this a case of a complex of closely-related species? Only the Barrolandia sample has all possible forms (queen, male, major worker, minor worker), while in the other cases, there are only some of the forms. This makes it difficult to make a decision, and I prefer the conservative option of assuming that all of this material is conspecific. The fact that there is variation in a sample from a single nest, and even in the same individual worker, leads me to think that this is the most reasonable choice.

C. tenua (described below) might thus eventually turn out to be a synonym for *C. coeca*; nevertheless in *C. tenua* the head sculpturing is less imprecise than in *C. coeca*, in which the ruguale are more raised from the tegument and cover the entire head. *C. tenua* does not have either the striation or the longitudinal rugulation of *C. coeca* and on the pronotal dorsum there are dense, dark, piligerous punctures. Only additional material, including both sexes, will allow resolution of whether *C. tenua* is distinct from *C. coeca*.

Carebara panamensis **(Wheeler) comb. nov.**

(Figs. 7E, 13)

Oligomyrmex panamensis Wheeler, 1925:175 (w, s); Bolton, 1995:300.
Erebomyrma panamensis (Wheeler): Wilson, 1986:61.

Queen measurements (provisionally asigned): HW 0.43 HL 0.55 SL 0.26 EL 0.08 PW 0.31 WL 0.78 GL 1.13 TL 2.98 CI 78 SI 60.

Head longer than wide, posterior border of head slightly concave. Sides of head slightly narrowed toward basal border. Mandible with 5 stout tooth. Three ocellae present, each in a concavity. Mesosoma in side view very similar to soldier/ergatoid of *C. panamensis*, although modified as myrmicine queens. Propodeum unarmed, narrowly rounded. Propodeal spiracle small, low, close to metapleural gland bullae. Subpetiolar process small. U-shaped trench in the basalmost portion of the first tergum. Body smooth and shining, head sub-opaque densely and longitudinally rugulose. Pronotum and most of mesonotum finely longitudinally striated. Short curved hairs densely over body, except propodeum, petiole and postpetiole. Hairs longer on clypeus, with a few on head, promesonotum, petiole, postpetiole and gaster. Color yellowish.

Comments. *C. panamensis* is only known from a very small soldier/ergatoid (1.3 mm) and a tiny worker (0.90 mm) from Panamá (Wheeler 1925). The soldier exhibits characteristics that are apparently between those of female and soldier, with a single central ocellus. In the described soldier, the right eye is bigger than the left.

The worker corresponds to those typical of *Carebara* and neither the drawing nor the description is sufficient to separate it other American *Carebara* except for *C. anophtalma*, *C. reticulata* and *C. elongata*

The described female is tentatively assigned to *C. panamensis* on the basis of size, geographical proximity, general configuration of the mesosoma, and head/ mesosomal sculpturing. Positive association of females with soldiers will be necessary to confirm whether they are actually conspecific.

Carebara tenua **sp. nov.**

(Figs. 7A,B, 14)

Major measurements Type: HW 0.66 HL 0.93 SL 0.35 PW 0.39 WL 0.76 GL 1.13 TL 3.39 CI 71 SI 53.

Diagnosis. Head rectangular, posterior border deeply, semicircularly excised, sides straight, parallel. Mandible stout, masticatory border straight, forming an angle about 90° with basal border. Masticatory border with 5 stout teeth. Clypeus narrow, medial portion slightly concave. Frontal triangle well-defined. Frontal lobes somewhat continued posteriorly as short longitudinal rugulae. Scapes very short. Anterior ocellus present, otherwise eyeless. In side view mesosoma flat, metanotum slightly higher, propodeum lower. Pronotal suture feebly impressed dorsally. Metanotum narrow, much shorter than pronotum in dorsal view. Dorsal face of propodeum evenly curved on sloping face, without spines or angulations. Propodeal spiracle rounded, close to metapleural gland bullae. Petiole with short peduncle, lateral swellings and strong subpetiolar process. Postpetiole in posterior view campanuliform, ventrally with anterior carinae. Body sub-opaque, smooth. Head with a very tenuous longitudinal rugulation. Anterior half of pronotum reticulated, otherwise pronotum and mesonotum smooth, with dark piligerous points. Metapleura with a poorly-defined longitudinal striation, petiole and postpetiole with fine reticulation. Pubescence very sparse on head, otherwise absent. Long hairs (about 0.13 mm) densely over head, several on promesonotum, petiole, postpetiole and gaster. Body brown to light brown, head slightly darker.

Worker, Queen, Male: Unknown.

Holotype. BRAZIL. **Mato Grosso:** 1 soldier, Belo Horizonte, 29 jul 1975, *R.L. Araújo No. 6217*, deposited in MZSP.

Paratypes. 2 soldiers, same data as type, ICN and MZSP.

Comments. For differences with *C. coeca* see above, in the comments section of these species. The *C. urichi* soldier is bigger, robust, with strong sculpturing and angular propodeum. The *C. panamensis* soldier/ergatoid specimen has eyes (although unequal in size), marked sculpturing on the head, and tenuous sculpturing on pronotum and promesonotum. *C. bruchi*, from Argentina, is also closely-related. I have not seen the types for this species, described from a female (Santschi 1933), and for which Kusnezov (1951) proposed a (very brief) description of a dinergatogyne. The latter author also illustrated the worker thorax, the form and size of which imply that it is not possible to distinguish it from a *C. panamensis* worker.

The *C. tenua* worker is unknown, although it is probably very similar to that of *C. panamensis*. These soldiers were apparently collected in or near a termite nest.

Carebara escherichi species complex

Diagnosis of workers: see Bolton & Belshaw 1993:182.

The species in this complex correspond to *Paedalgus sensu* Bolton & Belshaw (1993). The head is slightly narrower anteriorly, there are always eyes present (although reduced to a few ommatidia) and the propodeum is very short. All the species described here match this diagnosis well (but see *C. intermedia* below); it can thus be considered a monophyletic group within *Carebara*. Of the three groups proposed here, this is the only one that is almost certainly monophyletic, since it includes the African and Sri Lankan species described by Bolton & Belshaw (1993) as well.

Species of the Neotropical Region subdivide into two subcomplex, based on the size and placement of the foveae in the head. In the first subcomplex (Fig. 8D, *C. brasiliana, C. inca, C. nuda, C. paya* and *C. pilosa*), the foveae are big with the spaces between the inferior foveae less than foveal diameter. In the second subcomplex (Figure 8A, *C. angulata, C. audita, C. kofana, C. majeri, C. reina, C. semistriata* and *C. striata*) the foveae are small, and the interfoveal spaces are greater than foveal diameter.

C. intermedia stand alone in the group and this species may belong to other group. This species is not included in the key below, but the reader can distinguises it clearly by the diagnosis at the end of this section.

Key to species (workers):

1. Dorsum of head densely sculptured with shallow foveolated punctures whose diameters are greater than the spaces separating them (as in Fig. 8D) 2
1’. Dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated betwen them (as in Fig. 8A) 6
2. Body totally devoid of standing hairs, appresed pubescence very scarce; Brazil .... *C. nuda* sp. nov.

2’. Body with few to abundant standing hairs; appresed pubescence moderate to heavy 3
3. Head with more than 10 standing hairs 4
3’. Head with less than 10 standing hairs: very few or none 5
4. Promesonotum with about 15 standing hairs; legs without standing hairs; Brazil .... *C. brasiliana* sp. nov.
4’. Promesonotum with more than 20 standing hairs; mid and hind tibia each with about 2-8 standing hairs; Brazil .... *C. pilosa* sp. nov.
5. First tergum of gaster with several standing hairs; mesosoma narrow dorsoventrally, promesonotum flat in dorsal view, propodeal lobes evenly curved (Fig. 8K); Colombia .... *C. paya* sp. nov.
5’. First tergum of gaster without standing hairs; mesosoma not as above; Perú .... *C. inca* sp. nov.
6. Promesonotum devoid of standing hairs; Brazil .... *C. majeri* sp. nov.
6’. Promesonotum with at least 2-4 standing hairs 7
7. In dorsal view, promesonotum throughout or partially with fine longitudinal striation 9
7’ In dorsal view, promesonotum with dense reticulation, never striated 8
8. In lateral view the propodeum angulated (Fig. 8J); head dorsum with four standing hairs; legs with about four standing hairs each; Colombia and Ecuador .... *C. angulata* sp. nov.
8’. In lateral view the propodeum rounded (Fig. 8C); head dorsum with two standing hairs; legs without standing hairs; Colombia .... *C. audita* sp. nov.
9. Promesonotum throughout with longitudinal striation ……......................…… 10
9’. Most of promesonotum with longitudinal striation (Colombia) ….................................... 11
10. Standing hairs: none in head dorsum, four in promesonotum, none in propodeum, two in first tergum gaster (Colombia, Trinidad, Perú, Brazil) .... *C. striata* sp. nov.
10’. Standing hairs: two in head dorsum, six in promesonotum, two in propodeum, two in first tergum gaster (Western Colombia) .... *C. reina* sp. nov.
11. Mid and hind tibiae without standing hairs .... *C. semistriata* sp. nov.
11’. Mid and hind tibiae with standing hairs .... *C. kofana* sp. nov.

Carebara inca **sp. nov.**

(Fig. 11)

Worker measurements Holotype (Paratypes n=2): HW 0.29 (0.29 – 0.31) HL 0.35 (0.35 – 0.37) SL 0.21 (0.20) PW 0.19 (0.18 – 0.19) WL 0.34 (0.29 – 0.32) GL 0.34 (0.29 – 0.35) TL 1.63 (1.15 – 1.27) CI 89 (81 – 82) SI 68 (67 – 69).

Diagnosis. Head larger than broad, sides convex and parallel, posterior border nearly straight. Mandibles with four teeth. Median portion of clypeus longitudinally bicarinate, the carinae diverging anteriorly. Frontal carinae short. A longitudinal and narrow stripe, smooth and shining, running from posterior medial margin of clypeus and between frontal lobes for about 40% of scape length. Basal half of scape narrow, then broadenig into distal portion. Scapes ending at a distance from vertexal border. Eyes reduced to 2 – 3 ommatidia. Mandibles with 9 segments, club 2-segmented. The apical antennomere larger than funicular segments. Promesonotum nearly straight, bluntly marginated laterally. Pronotal groove absent, metanotal groove feebly marked laterally. In dorsal view mesosoma with two broad concavities at level of metanotal groove. Propodeum unarmed, dorsum very short sloping down to sloping face. Propodeal lobes narrow, lamellated. Propodeal spiracle circular, relatively larger, the orifice backward, spiracle low and close to posterior margin. Petiole with short peduncle, petiolar spiracle at level of the node. Petiole ventrally with a very tiny angle or teeth anteriorly. Gaster in dorsal view with medial portion concave and lateral angles well-marked. Sting well-developed and functional. Dorsum of head densely sculptured with shallow foveolated punctures whose diameters are greater than the spaces separating them; dorsum of promesonotum with irregular rugulae, most of them anteriorly; basal sloping face of propodeum with transverse rugulae; sides of mesosoma and petiole finely reticulated. Scapes, dorsum of head, promesonotum, petiole, postpetiole, gaster and tibiae with dense short and curved pubescence; long hairs (more or less three times larger than short hairs) few and distributed as follow: four in the clypeal area; two hairs from the anterior clypeal area projecting forward and outward; four in the anterior pronotal border; two posteriorly in the promesonotal dorsum; two in propodeal dorsum, two in the petiole, two in the postpetiole, none on first tergum. Light brown throughout.

Holotype worker. PERU. **Madre de Dios:** Cocha Cashu, 19°90'S 71°36'W, 3500 ft, sep 1999, D.W. Davidson, in litter wet forest, deposited in LACM.

Paratypes. 10 workers (same data) deposited in: BMNH, IAvH, LACM, MCZ, MIZA and MZSP.

Comments. Species distinguishes by body with relatively few standing hairs and first tergum devoid of standing hairs.

***Carebara angulata* sp. nov.**

(Figs. 8J, 11)

Worker measurements Holotype (Paratypes n=2): HW 0.31 (0.31) HL 0.36 (0.35) SL 0.19 (0.18) PW - (0.20 – 02.4) WL 0.29 (0.27 – 0.28) GL 0.36 (0.34 – 0.35) TL 1.24 (1.20 - 1.22) CI 86 (88) SI 60 (58). [The bad mounting of de ecuatorian paratype prevents some measurements. The scapes and legs are broken].

Diagnosis. As. *C. inca* with the following differences:

A longitudinal and less narrow stripe, subopaque. Eyes reduced to 1-2 ommatidia. Propodeum slightly angulated. Propodeal spiracle circular, spiracle low and nearly in contact with bullae of metapleural gland. Dorsum of head densely sculptured with deep foveolated punctures whose diameters are smaller than the spaces separating them; dorsum of promesonotum anteriorly with a very fine and irregular longitudinal rugulae, posteriorly with dense and well-marked reticulae, somewhat more widely spaced in propodeal dorsum; sloping face of propodeum without transverse rugulae. Gaster smooth and shining. Dorsum of head with fine appressed pubescence, dorsal promesonotum with only a little appressed pubescence; rest of body without. Short curved and scattered pubescence on femora and tibiae. Long hairs (more or less three times longer than short hairs) few and distributed as follows: four in the clypeal medial area; two over each frontal carinae; four on the posterior part of head (two on each side, near the occipital border); twelve on promesonotal dorsum; two on propodeal dorsum; two (and four medium size) on the petiole, four on the postpetiole, several scattered on tergal dorsum; more or less four median dorsal hairs on each tibia. Body brown, gaster darker.

Holotype worker. COLOMBIA. **Nariño:** Orito, Kofán Territory, 00°30'N 77°13'W, 1000 m, Winkler trap in forest litter, 25 sep 1998, *E.L. González*, deposited in IAvH.

Paratypes. COLOMBIA. **Nariño:** 1 worker, Jardines de Sucumbíos, Kofán Territory, Rumiyaco-Ranchería cross rivers, 1000 m, 0°28'N 77°17'W, Winkler trap in litter forest, *E.L. González*, IAvH; ECUADOR. Napo, 2 workers, Limoncocha, 00°24'S 76°36'W, 20 jul 1973, *C.W. Rettenmeyer No. 5300*, MZSP.

Comments. This species is easily recognized by its promesonotal sculpturation. The anterior half is more or less longitunially striated and the posterior half densely reticulated. In side view, the propodeum forms a slightly angle between the dorsal and sloping faces. The head has four hairs near the occipital corners.

Carebara brasiliana **sp. nov.**

(Fig. 11)

Worker measurements Holotype (Paratype): HW 0.30 (0.31) HL 0.35 (0.37) SL 0.19 (0.20) PW 0.18 (0.22) WL 0.30 (0.32) GL 0.38 (0.38) TL 1.23 (1.29) CI 86 (86) SI 63 (63).

Diagnosis. As. *C. inca* with the following differences:

Median portion of clypeus longitudinally bicarinate, the carinae diverging strongly anteriorly. A longitudinal and less narrow stripe, sub-opaque. Eyes reduced to 1 ommatidium. Propodeal spiracle lower nearly touching tangentially the bullae of metapleural gland. Dorsum of head densely sculptured with shallow foveolated punctures whose diameters are larger than the spaces separating them; dorsum of promesonotum densely reticulated, as well as sloping face of propodeum. Dorsum of head with dense short curved pubescence, less on promesonotum, a small amount on dorsum of petiole and postpetiole; absent in first tergum. Long hairs (more or less three times longer than short hairs) distributed as follows: six in the clypeal area; about eight on the vertexal border and occipital corner, about four rows of 4-5 on head dorsum; twelve on promesonotal dorsum; two on propodeal dorsum; two on the petiole, four on the postpetiole, several scattered on tergal dorsum; none on scapes or legs.

Holotype worker. BRAZIL. **São Paulo:** Botucatu, 19 dic 1990, *B.H. Dietz* (deposited in MZSP).

Paratypes. BRAZIL. **São Paulo**: 1 worker, Botucatu, Rubiao Jn., 27.ene.1991, in *Camponotus rufipes* nest, *B.H. Dietz, leg.;* idem, 4 workers, Barueri, 7 ene 1968, *K. Lenko col. No. 5135*; idem, 2 w, Santana de Parnaíba, 7 mar 1970, *K. Lenko col. No. 5113*; idem, 1 worker, Salesópolis, E.B.B., 5-7 jul 1997, *C.I. Yamamoto*; idem, 1 worker, Juquituba, 30 sep 1960, *W.W. Kempf No. 3627*; idem, 3 workers, Salesópolis, E.B. Boracéia, 2-6 may 1997, *D. Agosti, C.R.F. Brandão & C.I. Yamamoto*; idem,12-17 jun 1997, *B.H. Dietz & C.I. Yamamoto*, deposited in BMNH, CEPLAC, IAvH, JTL, MCZ, MIZA, MZSP and USNM.

Comments: This species and *C. pilosa* have abundant standing hairs on promesonotum (more than 15), although *C. brasiliana* lacks standing hairs on legs (present in *C. pilosa*).

Carebara pilosa **sp. nov.**

(Figs. 8D-E, 11)

Worker measurements Holotype (Paratype): HW 0.31 (0.30) HL 0.38 (0.37) SL 0.21 (0.19) PW 0.18 WL 0.34 (0.32) GL 0.38 (0.35) TL 1.28 CI 82 SI 68.

Diagnosis. As. *C. inca* with the following differences:

Median portion of clypeus longitudinally bicarinate, the carinae with sides nearly parallel. A longitudinal and less narrow stripe, sub-opaque. Eyes reduced to 2 ommatidia. Propodeal spiracle lower, near and above the bullae of metapleural gland.; dorsum of promesonotum densely reticulated, as well as sloping face of propodeum. Dorsum of head with dense short curved pubescence, less on promesonotum, a little on legs, dorsum of petiole, and postpetiole; absent in first tergum. Long hairs (more than 0.063 mm) distributed as follows: about eight in the clypeal area; about 30 on head dorsum; about 16 on promesonotal dorsum (the most external 0.1

mm); two on propodeal dorsum; 6-8 on mid and hind tibiae; two long and four short on the petiole, two long and several short on the postpetiole, moderately abundant on tergal dorsum.

Holotype worker. BRAZIL. Nova Teutonia, 27°11’08”S 52°23’W, 300-500m, ene 1957, *F. Plaumann*, deposited in MZSP.

Paratypes. BRAZIL. Nova Teutonia, 4 works, mar 1971, *F. Plaumann No. 7863*; **São Paulo**: 2 workers, Juquitiba, 30 oct 1960, *W.W. Kempf No. 3627*, BMNH, IAvH, MCZ, MIZA, MZSP and USNM.

Comments. Very similar to *C. brasiliana*. *C. pilosa* has more hairs on the body, several long hairs on mid and hind tibiae, the clypeal carinae are straight, and the propodeal spiracle is higher.

***Carebara striata* sp. nov.**

(Figs. 8F-H, 11)

Worker measurements Holotype (Paratypes n=2): HW 0.31 (0.29 – 0.31) HL 0.38 (0.35 – 0.36) SL 0.19 (0.18) PW 0.20 (0.21) WL 0.29 (0.29 – 0.30) GL 0.38 (0.32 – 0.38) TL 1.26 (1.20 – 1.30) CI 82 (83 – 86) SI 60 (61 – 62).

Diagnosis. As. *C. inca* with the following differences:

A longitudinal and less narrow stripe, sub-opaque. Eyes reduced to 1 ommatidium; lamellae of metapleural lobes low; dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated; dorsum of promesonotum with dense, fine longitudinal striation mixed with scattered small punctures, sloping face of propodeum densely reticulated. Scapes, dorsum of head, promesonotum and legs with appressed to feebly curved pubescence, denser on head. Body nearly naked of long hairs, with only a few (about 0.05 mm) distributed as follows: four in the clypeal area; two on each frontal lobe; four on promesonotum, none on propodeum, none on legs; two on petiole, two on the postpetiole, two on first tergal dorsum. Body brown, appendages lighter.

Holotype worker. COLOMBIA. **Magdalena:** 3 km SE Minca, 11°08’N 74°06W, 105 m, 13 ago 1985, *J. Longino No. 747-S*, deposited in LACM.

Paratypes. 4 workers, same data as type; BRAZIL. **Pará**: 7 workers, Belém, Utinga Forest Pres, 1968, in frog stomach of *Dendrobates quinquevittatus. P.A. Silvestre*; 2 workers, Alter do chao, 2°30’s 54°57’W 30 apr 2002, J.M. Vilhena leg. PERU. **Lima:** San Martín, 2 workers, Achinamiza, in frog stomach of *Dendrobates quinquevittatus*, *H. Bassler*. TRINIDAD. Tumpuna Reserve, 9 ago 1976, *J. Noyes*, *leg*., deposited in BMNH, IAvH, ICN, LACM, MCZ, MIZA, MZSP, PSW and USNM.

Comments. This species is easily separated from any other by the near absence of long hairs, with only a very few on the body. The tiny and sparsed foveae of the head, and the finely striated promesonotum also clearly distinguish *C. striata*. Interestingly, both the Brazilian and Peruvian samples were collected from the stomach of *Dendrobates* frogs.

***Carebara reina* sp. nov.**

(Fig. 12)

Worker measurements Holotype (Paratypes n=2): HW 0.33 (0.30 – 0.31) HL 0.38 (0.36 – 0.38) SL 0.20 (0.20) PW 0.20 (0.21) WL 0.31 (0.28 – 0.31) GL 0.39 (0.35 – 0.38) TL 1.30 (1.22 – 1.29) CI 87 (81 – 83) SI 61 (61 – 64).

Diagnosis. Similar to *C. inca* with the following differences:

A longitudinal and less narrow stripe, subopaque. Eyes reduced to 1 ommatidium; lamellae of metapleural lobes low; dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated; dorsum of promesonotum with dense, fine longitudinal striation mixed with scattered small punctures; sloping face of propodeum densely reticulated. Scapes, dorsum of head, promesonotum and legs with appressed to feebly curved pubescence, denser on head. Body nearly naked of long hairs, with only a few (about 0.05 mm) distributed as follows: four in the clypeal area; two on each frontal lobe; four on promesonotum, none on propodeum, none on legs; two on petiole, two on the postpetiole, two on first tergal dorsum. Body brown, appendages lighter.

Holotype worker. COLOMBIA. **Valle del Cauca:** 1 worker, Alto Anchicayá, Farallones National Park, 3°26'N 76°48'W, 600-900 m, winkler trap, 19-24 jun 2001, *S. Sarria, leg.*, deposited in IAvH.

Paratypes. 10 workers, same data as type, BMNH, CWEM, IAvH, JTL, MCZ, MIZA, MZSP, PSW and USNM.

Comments. This species is very close to *C. striata* but are easily separated by the setal pattern, with more hairs than in *striata*. This is the only species of the group known west to Andes, it occurs in the pacific region. Named in honor to Claudia A. Reina-Tovar, my laboratory auxiliar, by their efforts in sorting many minute ants from pitfall and Winkler samples.

Carebara semistriata **sp. nov.**

(Fig. 12)

Worker measurements Holotype (Paratype): HW 0.29 (0.31) HL 0.35 (0.35) SL 0.19 (0.18) PW 0.19 (0.21) WL 0.28 (0.30) GL 0.34 (0.32) TL 1.17 (1.20) CI 83 (87) SI 66 (62).

Diagnosis. As. *C. inca* with the following differences:

Eyes reduced to 1 ommatidum. Lamellae of metapleural lobes low; dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated; mid dorsum of promesonotum with dense, fine longitudinal striations mixed with scattered small punctures, periphery of promesonotum, dorsal and sloping face of propodeum and petiole densely reticulated. Postpetiole and gaster smooth and shining. Scapes, dorsum of head, promesonotum and legs with appressed pubescence, denser on head. Body nearly naked of long hairs, with only a few (about 0.05 mm) distributed as follows: four in the clypeal area; two on each frontal lobe; two on the head (each one near occipital corner), eight on promesonotum, two on propodeum, none on legs; two on petiole, four on the postpetiole, several on first tergal dorsum. Body brown, appendages lighter, most of gaster dark.

*Holotype worker***.** COLOMBIA. **Bolívar:** Los Colorados National Park, 320 m, Winkler trap in forest litter, 15-19 sep 2000, *E. Deulufeut, leg.*, deposited in IAvH.

Paratypes. 4 workers, same data as type, BMNH, IAvH, MCZ; NICARAGUA. 5 workers, Isla Diamante, 10 oct 1994, *J.P. Caldwell leg. No. 8650*, CEPLAC and ICN.

Comments. This species is similar to *C. striata*. However, in this species the longitudinal striation cover the entire promesonotum and the hair number differs (see keys).

Carebara kofana **sp. nov.**

(Fig. 12)

Worker measurements Holotype: HW 0.30 HL 0.38 SL 0.25 PW 0.21 WL 0.30 GL 0.35 TL 1.26 CI 79 SI 83.

Diagnosis. As. *C. inca* with the following differences:

Eyes reduced to 1 ommatidia. Lamellas of metapleural lobes low; dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated betwen them; mid dorsum of promesonotum with dense, fine longitudinal striation mixed with scattered small punctures, perifery of promesonotum, dorsal and declivity face of propodeum and petiole densely reticulated. Postpetiole and gaster smooth and shinig. Scapes, dorsum of head, promesonotum and legs with appressed pubescence, more dense on head. Body nearly naked of long hairs, with only few (about 0.05 mm) distributed as follow: four in the clypeal area; two in each frontal lobe; two in the head (each one near to occipital corner), ten in promesonotum, two in propodeum, four in mid tibiae, four in hind tibiae; two in petiole, four in the postpetiole, several in first tergal dorsum. Body brown, appendages lighter, most of gaster dark.

Holotype worker. COLOMBIA. **Nariño:** Jardines de Sucumbíos, Territorio Kofán, Rumiyaco-Ranchería rivers, 0°30'N 77°13'W, 1000 m, 28 sep 1998, winkler No. 3, *E. L. González, leg.,* deposited in IAvH.

Paratypes. 1 workers, same data as type, 700 m, IAvH.

Comments. This species is very similar to *C. semistriata*. However, *C. semistriata* lack standing hairs in the middle and hind legs, being present in *C. kofana*. Name proposed in honor of Kofanes community, who help the Humboldt team in general collecting of birds, plants and insects in their *resguardo*. The paratype measurements are basically as in the holotype.

***Carebara audita* sp. nov.**

(Figs. 8A-C, 12)

Worker measurements Holotype (Paratypes n=2): HW 0.28 (0.29 – 0.31) HL 0.35 (0.35 – 0.36) SL 0.20 (0.18) PW 0.19 (0.21) WL 0.28 (0.29 – 0.30) GL 0.33 (0.32 – 0.38) TL 1.16 (1.20 – 1.30) CI 80 (83 – 86) SI 71 (61 – 62).

Diagnosis. As. *C. inca* with the following differences:

A longitudinal and less narrow stripe, subopaque. Anterior margin of clypeus clearly concave between the carinae. Eyes reduced to 4 ommatidia. Lamellar metapleural lobe wide; petiolar peduncle longer; dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated; dorsum of promesonotum with dense and strong reticulation, including propodeal slope. Scapes, dorsum of head, promesonotum and legs with appressed to feebly curved pubescence, denser on head. Body nearly naked of long hairs, with only a few (about 0.05 mm) distributed as follows: six in the clypeal area; two on each frontal lobe; two on head dorsum, each near the occipital corner, about 12 on promesonotum, two dorsal on the propodeum, none on legs; two on petiole, about six on the postpetiole, few on first tergal dorsum. Body yellowish brown, gaster darker.

*Holotype worker***.** COLOMBIA. **Nariño:** Orito, Kofán Territory, 700 m, 20 sep 1998, Winkler trap in forest litter, *E.L. González, leg.*, deposited in IAvH.

Paratypes. 4 workers, same data as type, BMNH, IAvH, MCZ and MZSP.

Comments. Readily recognized by the concavity between the clypeal carinae (Fig. 8A), two hairs in the head and petiolar peduncle larger than other species in the group. Named in honor of my partner, Claudia Martínez for their love, friendship, patiente and many hours of company in the long hours of taxonomic work.

Carebara nuda **sp. nov.**

(Figs. 8I, 11)

Worker measurements Holotype: HW 0.29 HL 0.38 SL 0.19 PW 0.21 WL 0.28 GL 0.38 TL 1.25 CI 77 SI 66.

Diagnosis. Median portion of clypeus longitudinally bicarinate, the carinae diverging strongly anteriorly. A longitudinal and less narrow stripe. Eyes reduced to 1 ommatidium. Propodeal spiracle lower near and above bullae of metapleural gland. Dorsum of head densely sculptured with shallow foveolated punctures whose diameters are greater than the spaces separating them; dorsum of promesonotum and sloping face of propodeum densely reticulated. Dorsum of head with short curved pubescence (more towards borders), less on legs, a little on anterior margin of pronotum; absent on mesosoma and gaster. Long hairs absent on the body. A very few short hairs on petiole, postpetiole and gaster. Yellow brown.

Holotype worker. BRAZIL. Nueva Teutonia, 27°11'S 52°23'W, 300-500 m, dic 1957, *F. Plaumann No. 194*, deposited in MZSP.
Paratypes. 22 workers, same data as type, deposited in BMNH, CEPLAC, CWEM, IAvH, IML, JTL, LACM, MCZ, MIZA, MZSP, PWS, UNCB and USNM.

Comments. This is the only known American *Carebara* of the *escherichi* group totally devoid of long hairs on body. There is little pubescense, limited to just a few areas.

Carebara paya **sp. nov.**

(Figs. 8K, 12)

Worker measurements Holotype: HW 0.28 HL 0.34 SL 0.19 PW 0.18 WL 0.29 GL 0.31 TL 1.11 CI 82 SI 71 68.

Diagnosis. As. *C. inca* with the following differences:

A longitudinal and narrow stripe between frontal lobes, somewhat continued posteriorly beyond the posterior limits of frontal lobes. Eyes reduced to 1 ommatidium. Promesonotum dorsally straight in dorsal view, anteriorly the dorsal face changing abruptly with anterior face, posteriorly sloping evenly, including the propodeal lobes which form a broad concavity. Petiolar peduncle nearly absent. Dorsum of head densely sculptured with shallow foveolate punctures whose diameters are greater than the spaces separating them; dorsum of promesonotum densely reticulated, fading in propodeal slope. Scapes, dorsum of head, promesonotum and legs with curved pubescence, denser on head, less dense on petiole and postpetiole. Body with a few long hairs (about 0.05 mm) distributed as follows: four in the clypeal area; about 6 on promesonotum, two dorsal on the propodeum, none on legs; two on petiole, about four on the postpetiole, a few on first tergal dorsum of gaster. Body yellowish brown.

Holotype worker. COLOMBIA. **Putumayo:** La Paya National Park, pitfall trap, 24-25 sep 2001, *E.L. González, leg.*, deposited in IAvH.

Comments. Recognized by the absence of long hairs on dorsum of head, promesonotum flat dorsally, propodeal lobes broadly concave posteriorly and petiolar peduncle very short.

Carebara majeri **sp. nov.**

Worker measurements Holotype: HW 0.30 HL 0.34 SL 0.18 PW 0.21 WL 0.34 GL 0.32 TL 1.21 CI 90 SI 60.

As. *C. inca* with the following differences:

Diagnosis. A longitudinal and less narrow stripe, feebly smooth and shining. Eyes reduced to 4 ommatidia; lamellae of metapleural lobes low, short; dorsum of head densely sculptured with very small, shallow foveolate punctures, broadly separated; dorsum of promesonotum strigulate punctate, with feebly longitudinal strigulation, sloping face of propodeum densely reticulated. Scapes, dorsum of head, promesonotum and legs with appressed to feebly curved pubescence, denser on head. Body nearly naked of long hairs, with only a few (about 0.05 mm) distributed as follows: four in the clypeal area; none on promesonotum, two on propodeum, none on legs; two on petiole, two on the postpetiole, two on first tergal dorsum. Body dark brown, appendages lighter.

Holotype worker. BRAZIL. **Pará:** Trombetas, 1 ago 1992, *J.D. Majer No. 1408*, deposited in CEPLAC (No. 4552).

Comments. This species is easily separated from any other by the poor number of long hairs, with only a very few on the body and none in promesonotum. This species is named in honor of Dr. Jonathan D. Majer, collector of the type and Australian myrmecologist.

Carebara intermedia sp. nov.

Worker measurements Holotype: HW 0.28 HL 0.33 SL 0.18 PW 0.19 WL 0.26 GL 0.23 TL 1.02 CI 85 SI 64.

Diagnosis. Eyes reduced to 1 ommatidium. Promesonotum slightly convex in dorsal view, separated from propodeum by clear constriction. Propodeal lobes wide, conspicuous, they upper end clearly angulated in dorsal oblique view. Petiolar peduncle short. Head, thorax (including propodeal lamellae) and petiole densely reticulated; postpetiole and gaster smooth and shining. All body with curved pubescence, denser on head and thorax, less on petiole, postpetiole and gaster. Body with the following standig hairs: four in the clypeal area; two in each side of head, close to occipital corners, 8 on promesonotum, none on propodeum, none on legs; two on petiole, two on the postpetiole, several on first tergal dorsum of gaster. Body yellowish brown.

Holotype worker. BELICE. Chiquibul Forest Reserve, Las Cuevas, 5-8 nov 1997, *J. Beard & L. Tarel*, deposited in BMNH.

Paratype. 1 worker, same data as type, ICN.

Comments. This species is very interesting, and maybe not a member of the *escherischi* species complex. What first is apparent is the deep and well-marked groove between the propodeum and the rest of the mesosoma. In the rest of the *escherischi* group, the mesosoma is continuous and the metanotal groove barely impressed. Another characteristic is related to the head and mesosomal sculpturing. In *intermedia*, this is densely reticulate, while in the *escherischi* group it is densely foveolate. Nevertheless, characteristics such as the mandibular configuration, the head profile in frontal view, reduced eyes, and pilosity align this species to the *escherischi* complex. The propodeal lobes are highly developed and have an angulation in the superior part (best seen in oblique dorsal view), but this may be a characteristic within the range of variability in the complex. The name, *intermedia*, itself alludes to the fact that this species is reminiscent of others within the genus, such as *C. urichi* or *C. eidmanni* (with well-impressed metanotal groove). As has been pointed out several times previously, only a global revision of *Carebara* may define clearly the infrageneric groupings that will indicate how to place unusual species such as those described here.

Concluding remarks

I have proposed in this work new limits for the genus *Carebara*, expanding it to include all the species formally described as *Paedalgus* and all the American species described as *Oligomyrmex*.

In the first place, judging by the American material examined, and a few Old World species, I propose *Carebara* as a natural grouping, defined by this combination of characters: antennae of 11 segments or fewer, with the club of 2 segments; anterior clypeal margin with 4 hairs (two on the sides of the medial line and the other two more distant); frontal carinae and antennal grooves absent and palps reduced to 2,2 (see more above in the genus diagnosis). These traits are found in all American workers, as well as in the few minor workers from other areas studied. The clypeal hairs are an important trait. In its medial part, the clypeus forms a straight or curved truncation, from which four hairs always arise, one pair projecting forward from near the medial point. A second pair is farther away, on the borders of the medial part (which can have a carina or flange projecting backwards) and project forwards and upwards (Fig. 9). There is never a medial clypeal hair (a *C. anophthalma* worker from Ecuador has a clypeal hair that is medial and developed, but this I interpret as a local variation.) This pattern is constant in New World workers, as well as in the few from elsewhere that I have seen. It can also be seen in major workers, although here, naturally it is modified (for example the medial clypeal portion is more curved and the hairs shorter and more curved than in the minors.) This clypeal-setal configuration, or this configuration combined with antennal club with two segments, may be a synapomorphy for the genus.

The complex denominated here *concinna* is equivalent to the *Oligomyrmex* of 11 antennal segments and appears to be a paraphyletic grouping that includes three species from the Americas, of which C. *longii* is the oddest, due to the absence of major workers and its extratropical distribution.

The complex *C. escherichi* (=*Paedalgus*) appears to be monophyletic, with the pronotum short and the head narrowed anteriorly, known from Costa Rica to Brazil, Africa and Sri Lanka. In spite of its minute size, the sculpturing of the head and promesonotum, and the number and distribution of erect hairs (on the body and median and hind tibiae) permits good separation of all the species. Major workers are not known for this group and I had no opportunity to study males or females. The apparent absence of majors might be real; if so, it would be another characteristic of this species group.

The complex *lignata* is equivalent to *Carebara sensu strictu*; as pointed out at the beginning, this group might be an artificial one. The principal characteristic is that all the (minor) workers are eyeless. Judging by the literature, it has always been assumed that in *Carebara s. str.* there are no major workers, in spite of works like that of Wheeler (1925:175-176 and Fig. 7) associating an *Oligomyrmex* (*O. panamensis*) with a typical *Carebara* (the minor worker), as the same species. In this work, there are numerous cases of major workers of ("*Oligomyrmex*") associated with (*Carebara s.str.)* minor workers; I can see no justification for considering them separate genera. In almost all the species in this group the minor workers present a constant hair distribution pattern on the body, with one or two pairs on the head (near the occipital spine), 4 in the anterior margin of the pronotum, a pair on the propodeal dorsum, and another pair in the declivity face of the propodeum. In some species this pattern might be modified (for example, by the reduction of the pair on the propodeal declivity) or there might be an additional pair (in the medial part of the promesonotum), or even a total absence of erect hairs (as in *C. anophthalma*). The basic plan in the genus (taking as a reference point the *Carebara* of 11 antennal segments and the neighboring *Pheidologeton*) is one of multiple erect hairs on the body, for which this pattern in the *C. lignata* group might potentially be considered a synapomorphy. How might Old World species be in this respect? The available material is very limited. In *Carebara vidua* from Zimbabwe (seen in SAM), there are numerous short hairs without any clear pattern; in an *Oligomyrmex* minor worker from Tanzania (SAM) there is a similar pattern (except for the propodeal hairs) and the propodeum has spines.

If indeed there are good reasons to unite *Carebara* with the typical *Oligomyrmex* and *Paedalgus*, using as evidence the major workers and, especially, the minor workers, one must admit that the sexual forms are highly variable. The paucity of samples impedes an adequate characterization of females and males in this genus. On one hand, the typical, huge *Carebara* queens contrasting with the tiny workers (e.g., Wheeler, 1903: Fig. 3) and, on the other, the queens and "soldiers" or mosaics of queen-major worker that have been described in *Oligomyrmex* suggest that, possibly, several times during the evolution of *Carebara* separate lineages might have arisen independently in which the size of queen and (minor) worker greatly diverged and in which the intermediate castes sometimes disappeared entirely (as in the *C. escherichi* complex?). The mosaic of transitional characters from queen to soldier is also interesting, with anomalous cases (Wheeler 1925, Kusnezov 1951). Kusnezov (1951) illustrated a case of "dynergatogyny" with a hybrid of female and soldier and in two major workers studied there appeared to be vestiges of wing sclerites. Could it be possible that some females might be modified to act as soldiers? It has been assumed that the soldier caste derived from the worker (Hölldobler & Wilson 1990); the suggestion that the caste arose from the female (Baroni Urbani & Passera 1996) has been questioned (Ward 1997). Perhaps *Carebara* may represent a rare case in which the females have secondarily assumed the role of major workers. This is one of the fascinating aspects of the biology of this little-studied genus (Wilson 1962, 1986).

As pointed out below, some points made in this revision must necessarily be taken as exploratory, as is the case for any taxonomic revision. Still, it seems important to point out that since it has not been possible to examine some types of *Oligomyrmex*, the taxonomic decisions associated with these names may change after critical examination of the material. Furthermore, the size and complexity of *Carebara* is greater than I realized at first. There are isolated descriptions of sexes and castes that are difficult to integrate according to criteria of biological species concept or morphospecies. In a few cases, I have tentatively made such associations, based on available material in the context of original descriptions and known distributions. An additional aspect to take into account is the size of the minor workers in this genus, some of which may be the smallest known worldwide: some are less than a millimeter in length. With the increasing use of Winkler or Berlesse traps, these tiny ants are showing up with far greater frequency in local inventories. For example, the *Carebara escherischi* complex (=*Paedalgus*), whose geographic distribution was supposedly limited to Africa and Sri Lanka, now includes 13 -15 species from Costa Rica to Brazil. Another major challenge to interpretation of *Carebara* (as for other dimorphic genera such as *Pheidole* and *Camponotus*) derives from the morphological monotony among species of the tiny workers, which are practically indistinguishable. Since workers are not always captured with a soldier or queen (and in some species, especially in the *Carebara* s. str. complex, the major worker caste has perhaps disappeared) it is nearly impossible to identify species. Still another characteristic of the group's complexity (which makes it especially interesting) is the mosaic in size of the queens and major workers. There are extremely large queens (or is it that the workers are especially minute?), queens of moderate size, and queen-soldier intercastes in which it is sometimes difficult to distinguish what might have been the original caste. In some cases, one part of the body can even differ from the other, *e.g.*, one side of the head eyeless and the other side with an eye. The number and development of the ocellae appears to differ intraspecifically in major workers, as well as the sclerites associated with the metanotum. The evolution of this group and its morphological mosaics in queens/majors poses a fascinating challenge to students of morphological and behavioral evolution in ants. This *caveat emptor* and the obvious limitations notwithstanding, I think this revision may clarify the group's taxonomy and provide a framework for a future global revision.

Appendix

Carebara, as understood here, includes the genera *Oligomyrmex* (and their junior synonyms *Aeromyrma*, *Aneleus*, *Erebomyrma*, *Lecanomyrma*, *Spelaeomyrmex*, *Hendecatella*, *Solenops*, *Sporocleptes*, *Crateropsis*, *Nimbamyrma*, *Neoblepharidatta*), *Paedalgus* and *Afroxyidris*. Therefore, all the species listed below (including their subspecies) are **new combinations** in *Carebara*. Bibliographical details in Bolton (1995, 2003). Fossils species preceded by an *.

From *Afroxyidris*: *crigensis*
From *Paedalgus*: *distincta*, *escherichi*, *infima*, *octata*, *pisinna*, *rara*, *robertsoni*, *sarita*, *sudanensis*, *termitolestes*.
From *Oligomyrmex*: *aborensis, acuta, afghana, africana, alluaudi, alpha, amia, angolensis, *antiqua, armata, arnoldiella, asina, atoma, bengalensis, beta, *bohemica, bouvardi, bruni, butteli, capreola, concinna, convexa, corniger, crassiuscula, cribriceps, debilis, deponens, diabolica, diabola, donisthorpei, elmenteitae, erythraea, frontalis, grandidieri, incerta, jacobsoni, jeanneli, khamiensis, lamellifrons, latro, leei, lucida, lusciosus, manni, menozzii, minima, mjobergi, nana, norfolkensis, nosindambo, oertzeni, overbecki, paeta, perpusilla, petulca, polita, polyphema, punctata, raja, rothneyi, rugata, santschii, sarasinorum, satana, sauteri, semilaevis, silvestrii, simalurensis, similis, sodalis, *sophiae, sublatra, subreptor, sundaica, tahitiensis, taiponica, taprobanae, thoracica, *thorali, traegaordhi, ugandana, viehmeyeri, villiersi, voeltzkowi, vorax, wheeleri, weyeri, wroughtonii*.

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